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NOTE:
Undergraduate Research-in-Progress Summaries have the names of the student's advisor in (parentheses).

BIOLOGICAL SCIENCES DIVISION
SESSION 01
ANIMAL MOLECULAR BIOLOGY
09:00AM SATURDAY, APRIL 4, 1998
JOHNSTON HALL 119
DAN E. KRANE - PRESIDING

9:00 REGULATION OF *AGR* GENE ACTIVITY IN THE POSTEMBRYONIC STAGES OF THE FRUIT FLY *DROSOPHILA*. JENNIFER E. NATHAN (GAE KOVALICK), DEPT. OF ZOOLOGY, MIAMI UNIVERSITY, OXFORD OH 45056.

The *Drosophila Antigen 5-related (Agr)* gene is active in the proventriculus, a three-layered structure located at the junction of the fore- and midguts. The *Agr* gene product appears to be a component of the peritrophic matrix, a tubular membrane that protects the midgut epithelium from ingested material. The matrix acts a barrier to pathogens entering the gut, and the *Agr* gene product may participate in the immune response within the gut. My objective is to determine what activates the *Agr* gene in the postembryonic stages of *Drosophila*. Others have shown that in the embryo, the *Agr* gene is active within a ring of cells two cells wide which extends completely around the circumference of the outer layer. By the end of the larval stage, the region of activity has extended to a ring five cells wide. The *Agr* gene is inactive during the pupal stage, but is reactivated following eclosion. My research is focussed on answering the following questions: 1) What activates the additional *Agr* gene expression seen in larvae as compared to embryos, and 2) what reactivates *Agr* expression in the adult following eclosion? This project uses *in situ* hybridization of labeled *Agr* RNA probes to fixed, paraffin-embedded sections of larvae and adults to study *Agr* gene activity during different developmental stages and following different experimental treatments. Specifically, hatching or eclosion, initiation of feeding, and the hormones juvenile hormone and ecdysone are being examined for their roles in activating *Agr* during the larval and adult stages.

9:15 GENETIC DIVERSITY PROVIDES A USEFUL MEASURE OF ENVIRONMENTAL IMPACTS. DAN E. KRANE. BIOLOGICAL SCIENCES, WRIGHT STATE UNIVERSITY, DAYTON OH 45435.

Environmental insults diminish an ecosystem's ability to maintain productive and adaptable populations of organisms. DNA profiles of six naturally occurring crayfish (*Orcorectes rusticus*) and snail (*Physella gyrina*) populations (N=18 for each site) from three separate sets of streams in Ohio reveals that changes in the underlying genetic diversity of these populations are significantly correlated ($p<0.001$) with the extent to which they have been exposed to anthropogenic stressors. The relatively non-migratory nature of these sentinel species makes them good indicators of long term selection due to pollutants and suggest that genetic analyses of may provide a sensitive means of directly assessing the impact of stressors upon local environments. The RAPD-PCR based system employed in this study simultaneously surveys a large set of random genetic markers that are free from selection by stressors and are more likely to provide a truer estimate of a population's genetic diversity than other molecular-based systems. As a direct result, it should allow detection of both chronic and acute exposures to stressors and provide earlier warnings of impending local extinctions.

9:30 GENETIC VARIABILITY IN FISH POPULATIONS IN TRIBUTARIES OF THE OLENTANGY RIVER BASED ON PCR AMPLIFICATION OF POLYMORPHIC LOCI. BRENDA F. HEYMAN, (DR. CAROL A. PARK, DR. A. JOHN GATZ), OHIO WESLEYAN UNIVERSITY, HWCC BOX #199, DELAWARE OH 43015.

Semotilus atromaculatus (CC), *Catostomus commersoni* (WS), *Lepomis cyanellus* (GS) and *Lepomis macrochirus* (BG), four species of fish in Delaware Run (a tributary of the Olentangy River), have been tagged and followed for five years. In this study, more movement of the fish from location to location has been observed than the literature suggests. However, except on rare occasions, no fish tagged in Delaware Run were ever found in the river itself. Therefore, despite the large amount of movement within each tributary, it was expected that significant genetic variation would be present between the same species of fish residing in different tributaries. Fin clips from specimens of the four species of fish from each of three tributaries of the Olentangy River were gathered. Sample numbers from Delaware Run were: 60 CC, 35 WS, 30 GS, 28 BG; Mill Creek: 34 CC, 13 WS, 18 GS, 3 BG; and Horseshoe Run: 31 CC, 14 WS, 28 GS, 32 BG. DNA was isolated from these clips using high salt and MCIA, precipitated with ethanol and confirmed on an Agarose gel. Fin clip DNA was adjusted to 200 ng/ul and stored in TE buffer. Template DNA at a concentration of 200-500 ng was used in each PCR reaction. Variable mtDNA regions were amplified with conserved primers for the comparison of genetic variation and population structure of Semotilus atromaculatus both within and between each tributary. Future research will examine the polymorphism in the additional three species.

9:45 GENE FLOW AND POPULATION STRUCTURE IN *ETHEOSTOMA CAERULEUM*. DAVID T. KYSELA AND E. RAYMOND HEITHAUS, BIOLOGY DEPT., KENYON COLLEGE, GAMBIER OH 43022.

Population structure plays a key role in determining the overall success of a population. Isolated subpopulations are likely to experience genetic drift and inbreeding depression, reducing genetic variation within the subpopulation and thereby increasing susceptibility to local extinction events. Long histories of subpopulation turnover, in turn, tend to reduce genetic variation at both the subpopulation and metapopulation levels. Our study examines the genetic structure of *E. caeruleum* in the Kokosing watershed. We expect greater population subdivision (1) with increasing distance between populations, and (2) between populations that are separated by impoundments or lowhead dams that may act as barriers to migration. Tissue samples from four populations of *E. Caeruleum* were analyzed using Randomly Amplified Polymorphic DNA (RAPD), scoring six variable loci. Clustering analysis of null allele frequencies (q) indicated genetic structuring concordant with geographic barriers to migration; high levels of similarity were exhibited between three populations from the continuous main river branch (min[S]=87.05), whereas the population above Knox Lake dam had relatively low similarity to main branch populations (S=59.35). The high similarities between main branch populations despite high distances between sites (>30 km), suggest that barriers to migration may be substantially more influential than isolation-by-distance factors in maintaining exhibited genetic population structuring.

10:00 EVOLUTION AND FUNCTION OF HIGHLY REPEATED SHORT SEQUENCES IN THE RABBIT GEMONE. ALLEN J. YORK & DAN E. KRANE, WRIGHT STATE UNIVERSITY, DEPT. OF BIOLOGICAL SCIENCES, DAYTON OH 45435.

C repeats constitute the predominant family of short interspersed repeats (SINES) within the rabbit genome. With an average length of 326 nucleotides and approximately one million copies present, C repeats represent 13% of the genome. Recent sequencing data has yielded the nucleotide sequence of 142 members of this family of repeats and allowed the establishment of an improved consensus for this SINE. Cladograms generated by a parsimony approach indicate that C repeats can be subdivided into at least three distinct subfamilies. Nucleotides at sites diagnostic for subfamilies appear to have changed in a punctuated and progressive manner during evolution, indicating that a limited number of progenitors have given rise to new repeats in waves of dispersion. A total of 15 rabbit C repeats (10% of all those that have been sequenced to date) are known to contribute functional elements for the genes into which they are inserted. These functional roles include 5' upstream promoters, polyadenylation signals, and in the case of four repeats contribute significant portions of the coding region of the gene into which they have inserted.

10:15 A FIRST LOOK AT THE SUMATRAN RHINOCEROS (*DICERORHINUS SUMATRENSIS*) MAJOR HISTOCOMPATIBILITY COMPLEX. JAMIE D. BRANSON, AND TERRI ROTH, PH.D. (SIMON K.LAWRANCE,PH.D.), OTTERBEIN COLLEGE, DEPT. OF LIFE SCIENCE, WESTERVILLE OH 43081.

In the dense forests of Southeast Asia, a highly fragmented, 400 member, population of Sumatran Rhinoceros persist. Over the last 10 years,their numbers have declined by more than 50% due to relentless poaching and general habitat disturbances. The effectiveness and defensive capacity of any animal's immune response is significantly influenced by the diversity of it's MHC. The MHC gene complex functions by encoding the specialized MHC glycoprotein molecules which deliver foreign peptides to the cell surface. MHC molecules that have been encoded by different alleles differ in their possible peptides bound. Therefore,individuals that are heterozygous at all or most MHC loci will assume the widest range of pathogen protection. MHC variance may serve as a natural regulator of mate selection,pregnancy,and offspring vitality. Species losing diversity due to small populations or interrupted gene flow are probably at an evolutionary disadvantage. MHC,and general genetic maintenance,are the essential ingredients for successful management of endangered vertebrate populations. In this study I propose to examine the MHC for a proposed breeding pair of Sumatran rhinoceros from the Cincinnati Zoo. Both a blood and hair DNA isolation procedure will be utilized to ultimately compare MHC polymorphisms. The series of intended procedures are as follows: DNA isolation,polymerase chain reaction amplification,MHC comparison via SSCP analysis,and the cloning of MHC sequences. My research plans serve to begin rhinoceros MHC characterization,and provide information relevant to breeding programs,population management,and the preservation of genetic diversity.

10:30 STRUCTURE-FUNCTION RELATIONSHIP OF THE *LYS2* GENE OF *CANDIDA ALBICANS*. V. BHATTACHERJEE AND J. K. BHATTACHARJEE, DEPT. OF MICROBIOLOGY, MIAMI UNIVERSITY, OXFORD OH 45056.

There are eight enzyme steps and more than ten unlinked genes responsible for the synthesis of lysine in *Saccharomyces cerevisiae*. These genes are not present in bacteria, plants, or humans. We have investigated some of these genes and enzymes as potential targets for detection and control of the diploid pathogenic yeast, *Candida albicans*. The 4.2 kb *LYS2* gene of *C. albicans* encodes the 150 kDa subunit of the 180 kDa heterodimeric enzyme α-aminoadipate reductase. To facilitate structural and functional studies of the *LYS2* gene, in this investigation both copies were selectively disrupted in strain CAI4. A targeting vector was constructed which contained a *URA3* cassette flanked by cloned *LYS2* sequences. The CAI4 recipient strain (*ura3*) was transformed with the linearized targeting vector. *URA3* transformants were selected and the genotypes analyzed by Southern hybridization in order to identify correct disruptions of one of the *LYS2* alleles. From such transformants, *ura3* mutants, generated by negative selection against the *URA3* marker, were retransformed as before in order to disrupt the remaining *LYS2* allele. Several *LYS2*-disrupted mutants were isolated which exhibited auxotrophy for lysine. The complete disruption of the *LYS2* locus was confirmed by Southern hybridization with appropriate probes. To determine the physiological effect of the *LYS2* disruption, cell extracts were assayed for the *LYS2*-encoded α-aminoadipate reductase activity. The parent, heterozygote and *LYS2*-disrupted strains exhibited significant, partial and no activity, respectively. These results demon-

strated that the *LYS2* gene of *C. albicans* is responsible for the synthesis of functional a-aminoadipate reductase.

SESSION 02

APPLICATION & UTILITY OF MOLECULAR MARKERS IN SYSTEMATIC BIOLOGY

01:30PM SATURDAY, APRIL 4, 1998

JOHNSTON HALL 111

LINDA E. WATSON - PRESIDING

1:30 USING INTER-SIMPLE SEQUENCE REPEAT (ISSR) MARKERS IN NATURAL POPULATIONS. ANDREA D. WOLFE, OHIO STATE UNIVERSITY. DEPT. OF PLANT BIOLOGY, 1735 NEIL AVE., COLUMBUS OH 43210-1293.

ISSR markers are based on single-primer PCR reactions where the primer sequence is derived from simple sequence repeats (SSRs; microsatellites) with a 5'- or 3'-anchor of 1-3 nucleotides. The amplified region lies between two SSRs oriented on opposite DNA strands within an amplifiable distance. ISSR bands are inherited in a codominant, Mendelian fashion, but are scored as dominant markers (band present or absent). ISSR markers have primarily been used to study cultivated plants (e.g., cultivar identification), but tests of the method in natural populations of *Penstemon* and *Hyobanch* (Scrophulariaceae) now show their usefulness for assessing patterns of hybridization, and species relationships. ISSR markers generally exhibit hypervariability in natural populations (upwards of 90% polymorphic). Individual DNA accessions of species included in this test of ISSR utility could be identified with one to three primers. Where comparative allozyme, RFLP, and RAPD data were available, ISSR markers have been more variable and have yielded better resolution of species relationships and population-level patterns.

2:00 RESOLUTION OF SYSTEMATIC, PHYLOGEOGRAPHIC, AND POPULATION GENETIC STRUCTURE IN PERCID FISHES FROM MITOCHONDRIAL DNA CONTROL REGION SEQUENCES. CAROL A. STEPIEN, DEPARTMENT OF BIOLOGY, CASE WESTERN RESERVE UNIVERSITY, CLEVELAND, OHIO 44106

Sequences from 300 individuals for the 1200 bp mtDNA control region were tested to discern evolutionary relationships at congeneric through subpopulation levels. Systematics, fine and broad scale geographic patterns, and divergences were resolved for the pike-perches *Stizostedion*, native to Eurasia and North America, and the ruffe *Gymnocephalus*, native to Eurasia and recently introduced to the Great Lakes of North America. Walleye, *S. vitreum*, had substantial genetic diversity and divergences among glacial refugia, lakes, basins, and spawning groups. Spawning philopatry and natal homing appear to have increased divergences. In contrast, native and introduced populations of the ruffe *Gymnocephalus* had low intrapopulation genetic variability, resulting from bottlenecks during the Ice Ages and subsequent rapid northward expansion. The introduced population of *G. cernuus* in the Great Lakes was genetically identical to that from the Danube River region. The history of glacial refugia and recolonization has resulted in interpopulational divergence in both genera.

2:30 MOLECULAR INSIGHTS INTO MACROEVOLUTION AND SPECIATION IN THE VIOLETS (*VIOLA*). HARVEY E. BALLARD, JR. DEPARTMENT OF ENVIRONMENTAL AND PLANT BIOLOGY, PORTER HALL, OHIO UNIVERSITY, ATHENS OH 45701.

With 550-600 species, the genus *Viola* is the largest member of the Violaceae. Comprehensive appraisals of relationships in *Viola* worldwide have never been accomplished, nor have modern approaches been used to investigate macroevolution or speciation in the genus. Phylogenetic studies of *Viola* using Internal Transcribed Spacer DNA sequences, place South American sections at the base, depict the two largest Northern Hemisphere sections, *Chamaemelanium* and *Nomimium*, as paraphyletic and polyphyletic, respectively, and yield an unexpectedly close relationship between the Hawaiian sect. *Nosphinium* and amphi-Beringian *Langsdorffianae*. Phylogenetic results urge drastic infrageneric remodeling of the genus. Stemlessness, specialized pollination traits and passive seed dispersal have evolved repeatedly, suggesting extraordinary evolutionary plasticity in presumably adaptive morphological traits. ITS data also illuminate evolutionary phenomena within species complexes. Investigations of the Hawaiian violets, a putative instance of adaptive radiation, portray classic morphological parallelisms in non-sister taxa inhabiting the same habitat on separate islands. Studies of the *Viola canadensis* complex relate six endemic species to separate peripheral populations of "proto"-*V. canadensis*, leaving extant *V. canadensis* as paraphyletic. However, eastern North American *V. canadensis* is tetraploid and surely derived from the western diploid, as are the endemics. This "twist" warns against careless presumptions of the "widespread = ancestral" paradigm without consideration of other systematic evidence.

3:00 BREAK

3:15 MOLECULAR SYSTEMATICS OF TRIBE ANTHEMIDEAE (ASTERACEAE). LINDA E. WATSON AND TIMOTHY M. EVANS, DEPT. OF BOTANY, MIAMI UNIVERSITY, OXFORD OH 45056.

The Anthemideae is primarily an Old World tribe of approximately 109 genera and 1740 species, with two major centers of diversity, including the Mediterranean Region and the Cape Province of South Africa. The tribe is widely recognized for its horticultural species that include the daisies, chrysanthemums, tansy, tarragon, chamomile, wormwood, and yarrow. Ecologically, the sagebrush species are dominant components of desert vegetation worldwide. To test existing classifications and to further resolve systematic relationships, we sequenced the internal transcribed spacers (ITS) of nuclear ribosomal DNA and a 1200 bp portion of chloroplast gene *ndh*F, and subjected the datasets to phylogenetic analyses, both independently and combined. The resulting molecular phylogenies are incongruent with morphology. However, the molecular phylogenies are strongly congruent with each other, despite being from different genomes. Furthermore, there is strong concordance with biogeography. Several South African clades are basal to the entire tribe, probably representing multiple, relictual lineages. The Mediterranean clade is monophyletic and exhibits a pattern of recent and rapid radiation. Many species of this tribe have reduced floral structures associated with breeding system modifications, which have probably resulted in convergent evolution. This has undoubtedly contributed to an inaccurate interpretation of homology of morphological characters. This, combined with rapid radiation, has probably resulted in a poorly resolved and inaccurate estimation of phylogenetic relationships.

3:45 A MITOCHONDRIAL DNA PERSPECTIVE ON RELATIONSHIPS IN THE ORCHIDACEAE. JOHN V. FREUDENSTEIN, DEPT. OF BIOLOGICAL SCIENCES, KENT STATE UNIVERSITY, KENT OH 44242.

Molecular systematic studies have focused largely on examination of DNA sequences of genes and spacers from the plastid genome, and of highly repeated genes or spacers from the nuclear genome. However, additional sources of data are available, including mitochondrial sequences and single-copy nuclear sequences. Sequences for the nad1b-c mitochondrial intron were obtained via automated fluorescent sequencing from species representing numerous tribes from across the five traditional subfamilies of Orchidaceae. The sequences show a relatively low rate of base substitution — less than that seen for the plastid gene rbcL — but exhibit a large amount of length variation. This combination of features means that sequence alignment is fairly straightforward, and provides an excellent opportunity to study the evolution of intron length. Insertions and deletions (indels) are distributed throughout the intron and often provide useful synapomorphies to unite taxa, although some indels show homoplasy. The basic insertion pattern appears in most cases to be a direct duplication of short adjacent sequences (1-10 bp). In some cases, much larger insertions of over 100 bp were observed. The data set is useful for cladistic analysis of the family, although there is not enough variation to provide resolution at lower levels (i.e., within subfamilies). The pattern agrees in large part with other molecular data for the family.

4:15 DISCUSSION

SESSION 03

AQUATIC SCIENCE: FISH, FROGS, TURTLES; MUSSELS AND OTHER INVERTEBRATES

01:45PM SATURDAY, APRIL 4, 1998

JOHNSTON HALL 118

MICHAEL A. HOGGARTH - PRESIDING

1:45 HABITAT SEGREGATION OF A NATIVE AND AN EXOTIC AMPHIPOD; THE ROLE OF FOOD AVAILABILITY AND FISH PREDATION. GRETA A BURKART, MARIA J. GONZALEZ & MATT C. THOMAS, WRIGHT STATE UNIVERSITY, DEPT. OF BIOLOGICAL SCIENCES, DAYTON OH 45435.

We documented the habitat preference of two amphipod species present in Lake Erie; the native species, *Gammarus fasciatus* and an introduced species, *Echinogammarus ischnus*. We analyzed the relative importance of food availability and vulnerability to fish predation of both species. A survey of macrophyte beds and zebra mussel colonies revealed that the exotic species was more abundant in zebra mussel habitats than was the native species. The opposite trend was observed in macrophyte beds. Under lab conditions the growth of each species was determined when fed a diet of zebra mussel feces & pseudo feces (FP) or macrophytes with epiphytes (ME). The native species grew larger when fed FP. The exotic grew larger when fed ME. This suggests that the habitat preference is not dependent on the type of food available. In the lab, macrophyte and zebra mussel habitats were simulated to examine the effects of habitat on amphipod vulnerability to fish predation. When zebra mussels were present yellow perch consumption rates of the native amphipod were greater than the rates of the exotic. The opposite trend was found in macrophyte habitat. This suggests that fish predation is an important factor driving the observed habitat segregation.

2:00 FISH ABUNDANCE AND SPECIES RICHNESS CRITERIA FOR RANKING OHIO RIVER EMBAYMENTS AND BACKWATERS. TED M. CAVENDER AND ANDREW BURT, OHIO STATE UNIVERSITY, MUSEUM OF BIOLOGICAL DIVERSITY, 1315 KINNEAR RD., COLUMBUS OH 43212.

Twenty-five Ohio River embayment and backwater sites between river miles 80 and 480 were sampled periodically over an 18 year time span as part of a monitoring program on Ohio River shoreline fishes. Collection data were analyzed at each site to produce profiles on utilization of the localities by young of the year fishes. Close to 80 species were found at the 25 sites of which

15 species were represented only by adult individuals or were considered very rare occurrences. Sites were ranked by total number of species and total number of individuals collected (minus gizzard shad). The top ranking sites showed a cumulative total of between 40 and 50 fish species. The maximum taken in one collection was 22 species recorded at three sample sites. In looking at numbers of young of the year, the best sites had 10 or more species each with population size greater than 1% of the total catch at the site. Each species showed large variations in abundance over the sampling period. Correlation analysis was run to determine negative or positive association between species. Different distribution patterns were observed for some species when their linear occurrence along the Ohio River shorelines was examined.

2:15 THE INVERTEBRATE PREY OF THE NORTHERN LEOPARD FROG, *RANA PIPIENS*, IN A NORTHEASTERN OHIO POPULATION. **Alexander B. Collier, Joe B. Keiper, and Lowell P. Orr, Dept. of Biological Sciences, Kent State University, Kent OH 44242.**

We analyzed the stomach contents of 13 adult and 19 juvenile *Rana pipiens* collected from a rehabilitated wetland in Summit County, Ohio during the summers of 1996 and 1997. First season juveniles were sacrificed and their stomachs were removed intact, and preserved individually in alcohol. We flushed the stomachs of adults to obtain their contents and released most frogs unharmed. The stomachs of three adults sacrificed following this procedure did not contain additional materials. We identified the invertebrate prey to family when possible using a dissecting microscope. The adult and juvenile frogs ingested a total of 142 invertebrates representing 2 phyla, 3 classes, 12 orders, and at least 34 distinct families. Major prey items included members of the orders Coleoptera, Hemiptera, Homoptera and Orthoptera. Many stomachs also contained portions of recently shed skin or unidentified plant material and other debris, which may have been inadvertently ingested as the frogs captured prey. Juvenile frogs consumed a greater diversity of taxonomic prey including invertebrates from 17 families not consumed by adults. Approximately 67% of all prey consumed were either fossorial or crawling organisms. Saltitory and flying insects were ingested less frequently. The presence of both diurnal and nocturnal prey indicates that the frogs fed throughout the 24 hour period. Our preliminary findings support the notion that *Rana pipiens* is an opportunistic species which feeds on a wide variety of prey.

2:30 POSSIBLE ANTIBACTERIAL PROPERTIES INTRINSIC TO *RANA PIPIENS* (NORTHERN LEOPARD FROG) EPITHELIUM. **John A. McGreevy, Dale A. Casamatta and Alex B. Collier, Dept. of Biological Sciences, Kent State University, Kent OH 44242-0001.**

All animals are exposed to a variety of potential bacterial, viral, fungal, and parasitic infections. Amphibians may be particularly vulnerable to outbreaks of disease due in part to their moist, permeable skins. Many amphibian species possess granular glands in the skin, which produce noxious or toxic secretions that decrease the animal's palatability to predators. *Rana pipiens* secretes no known noxious substances and is palatable to many predators, but the integument of this amphibian may possess intrinsic antimicrobial properties that are currently uninvestigated. Small populations of protozoa are common to the integument of healthy amphibians, and the possibility of bacterivory by integumentary protists as a control of bacterial populations is also investigated. The possibility of antibacterial compounds secreted from the skin of *R. pipiens* was tested by an antibacterial disk assay in two treatments. Frog epithelium was removed and homogenized in a polytron blender. The resultant slurry was then impregnated into filter disks and sterilized under ultraviolet light. These discs were then placed onto bacterial lawns from 35 environmental bacterial isolates. The second treatment consisted of discs impregnated with live frog epithelial exudate. Results indicate inhibition from the homogenized samples and no inhibition from the live samples. Integumentary samples were stained with Primulin and analyzed under UV light to detect the presence of bacterivorous protists.

2:45 COMPARISONS OF FISH FAUNA FROM OHIO RIVER BOAT RAMP AND EMBAYMENT SHORELINE COMMUNITIES. **Andrew M. Burt and Ted M. Cavender, Ohio State University, Museum of Biological Diversity, 1315 Kinnear Rd., Columbus OH 43212.**

Boat ramps on the Ohio River have been seined yearly for the past eighteen years to monitor young of the year fish communities. Observations have been made that indicate the boat ramp communities in the embayments contain more diverse fish communities than nearby shoreline communities. The purpose of this study was to determine the differences between the fish communities of the boat ramp and shoreline habitats. Collections were made using a 30-foot bag seine from July to October 1997, at Shawnee State Park Marina, OH; Greenup, KY boat ramp; and the Ginat Run, OH boat ramp. An increase in total species and in total individuals was observed on the boat ramps over the shoreline samples. Although Sorenson index values demonstrate similarities between species composition, the number of individuals of many species was significantly higher on the ramps. Of those, the stoneroller minnow (*Campostoma anomalum*) demonstrated the greatest percent disparity in abundance. Only 7 of 23 commonly seined species were more abundant in the shoreline samples. Results suggest there are differences between the two habitats and that the boat ramps provide resources which can be exploited by young of the year fishes. Benefits associated with the boat ramp communities remains to be determined.

3:00 Break

3:15 ALLOMETRIC COMPARISONS OF THE JAW STRUCTURE OF NORTHERN PIKE (*ESOX LUCIUS*) AND GRASS PICKEREL (*ESOX AMERICANUS VERMICULATUS*). **Joel D. Bingham, Hiram College, PO Box 1266, Hiram OH 44234.**

Allometry of jaw morphology of two closely related species, the northern pike (*Esox lucius*) and grass pickerel (*Esox americanus vermiculatus*) were compared through examining an ontogenetic series of each taxon in order to test the hypothesis that the smaller overall size of grass pickerel results from their reduced jaw structure relative to body size. This hypothesis is supported by data collected by Scott and Crossman (1973) that indicated that grass pickerel's snout length is 37.0-41.6% of head length while pike are 42.5-46.8%. Five measurements were taken from specimens of northern pike and grass pickerel; total length, head length, snout length, maxilla length, and head width. Contrary to the hypothesis, comparison of linear regression slopes of paired measures between the species appear to be almost identical indicating similarity of jaw size in both taxa. These results are interesting because northern pike (max. 133 cm) grow considerably larger than grass pickerel (max 38 cm), suggesting that the larger size of northern pike could be attributed to differences in metabolism, elevated aggressiveness, or habitat differences between the species.

3:30 POPULATION STATUS AND MICROHABITAT UTILIZATION BY THE PURPLE CATSPAW, A FEDERALLY LISTED ENDANGERED SPECIES OF FRESHWATER MUSSEL. **Michael A. Hoggarth, Department of Life and Earth Sciences, Otterbein College, Westerville OH 43081.**

The purple catspaw (*Epioblasma obliquata obliquata*) comprises the seventh most abundant of the 26 species of mussels found in Killbuck Creek in Wayne, Holmes and Coshocton counties, Ohio. A total of 67 living specimens of this species was found. The species occurs for a distance of 13.5 stream miles with the largest number of individuals (49) collected within a 100 meter reach of Killbuck Creek. The distribution of this species extends upstream of this center of population for a distance of 0.8 miles and downstream for a distance of 12.7 miles. Male and female specimens were collected from slightly different microhabitats. Males were found in deeper and swifter water than females and consequently were found in substrate with a greater percentage of coarse rather than fine sediments. On average, males were larger than females, however, no difference was detected in median age of living specimens collected. The oldest members of the population were 21 years old while the youngest specimen found was two years of age. All of the female specimens found, with the exception of the one 21 year old specimen, were gravid at the time of sampling. These data indicate that this population is viable and may support the application of experimental techniques to improve survivability and distribution of this rare species.

3:45 ANALYSIS OF HABITAT UTILIZATION AND NESTING ECOLOGY OF PAINTED TURTLES (*CHRYSEMYS PICTA*) AT THE DENISON UNIVERSITY BIOLOGICAL RESERVE. **Mark A. Skowronski (Linda C. Zimmerman), Dept. of Biology, Denison University, Granville OH 43023.**

I studied the ecology of painted turtles (*Chrysemys picta*) at the Denison University Biological Reserve; Granville Township, Licking County, Ohio. The three overall objectives of this study were to: (1) examine patterns of habitat utilization and estimate population size, (2) determine where and when females nested, and (3) quantify nest site characteristics.Location and activity of observed turtles, including basking behavior and site, was recorded during daily observation. I recorded ambient and max/min air, and ambient water temperatures, precipitation, and pond depth daily. Turtles were captured by hand, net, and basking trap. I measured the mass, carapace length and maximum carapace width, plastron length, maximum shell thickness, and right third foreclaw length of each individual. The marginal scutes were notched and turtles were returned to site of capture. I used radio telemetry to track gravid females. Vegetation biomass and soil type were sampled and solar radiation and ground temperature were quantified for each nest site and along two transects extending from the pond margins across open fields. A total of 45 turtles were captured in three ponds. Turtles preferred southwest and middle quadrats of the ponds. The first turtle nested on 13 June 1997 and the final nest was constructed on 20 July 1997. Nesting activity was associated positively with precipitation. Nest sites were constructed in open, sparsely vegetated areas. Nest sites received significantly more solar radiation and had significantly less vegetation than did potential nest sites along two transects. These findings strengthen our understanding of regional variation in habitat utilization and nesting ecology of painted turtles.

4:00 INVASION OF LAKE ERIE'S WESTERN BASIN BY ROUND GOBIES, *NEOGOBIUS MELANOSTOMUS* (PALLAS). **Ken Baker, Dept. of Biology, Heidelberg College, Tiffin, OH 44883.**

Round gobies were first recorded in North America in 1990 from the St. Clair River, probably introduced via ballast waters from transoceanic vessels from the Black, Caspian or Azov Seas. In 1993, the first gobies were recorded from Lake Erie at the mouth of the Grand River by Fairport Harbor. In 1996, the first gobies were recorded from the western basin by Lakeside, OH and West Sister Island. In 1996, I conducted a set of SCUBA-based surveys of benthic fishes and crayfish on the north side of Kelleys Island, in shallow-water, rocky-bottomed habitat deemed likely to be invaded by gobies. No gobies were observed there during numerous dives. In summer 1997, I increased my study to include sites from the east, and south sides of Kelleys Island, the east and west sides of South Bass Island, the south side of West Sister Island, and a set of 12 sites on Cone, Crib, and Locust Point Reefs. At all locations, 80 sq m transects were surveyed for abundances of gobies and other benthic fishes, and for crayfish. Video was recorded along most transects to document possible future changes in zebra mussel coverage. The highest goby densities were observed for West Sister (2.2 m^2 in August, 3.9 m^2 in October). Abundances on the south side of Kelleys increased from June (0.3 m^2) to August (0.7 m^2) but remained low (<0.1 m^2) on the east and north sides. Goby numbers by South Bass never exceeded 0.1 m^2. Abundances on the reef study sites varied from 0.1 to 1.3 m^2, with variation possibly associated with site depth, substrate composition, and location on the reefs.

4:15 DENSITY AND DIVERSITY OF AQUATIC SPECIES IN THE CONSTRUCTED RIPARIAN WETLAND ON THE OLENTANGY RIVER, COLUMBUS. **Matthew W.**

COCHRAN (DR. WILLIAM J. MITSCH), SCHOOL OF NATURAL RESOURCES, OHIO STATE UNIVERSITY, 2021 COFFEY RD., COLUMBUS OH 43210.

The Olentangy River Wetland Research Park is being constructed to perform research and educate students and the public about the vital ecological role that wetlands play. One role that wetlands fulfill is supporting and sustaining aquatic life. The purpose of this project was to quantify the density and diversity of aquatic life in two 1-ha. experimental wetland basins at the site. Basic minnow traps and Hester-Dendy traps were used to capture fish, amphibians, and invertebrates. Traps were arranged with nine traps per wetland from inflow to outflow. After sampling for 21 days, 3917 fish of five species, 119 amphibians of one species, and 1926 invertebrates of nine species were captured and quantified into categories of five centimeters increments. In both wetland basins, there was a species distribution gradient with the inflows having the greatest abundance and the outflows the least abundance. The most abundant fish and invertebrate species in the constructed wetlands were the Green Sunfish (*Lepomis cyanellus*), and Bloodworm (*Ceratopogonidae*).

SESSION 04

FLORISTICS & ETHNOBOTANY

01:30PM SATURDAY, APRIL 4, 1998

JOHNSTON HALL 106

LAZARUS W. MACIOR - PRESIDING

1:30 *THE OHIO JOURNAL OF SCIENCE*: APPROACHING ITS CENTENNIAL. WILLIAM R. BURK, JOHN N. COUCH BIOLOGY LIBRARY, UNIVERSITY OF NORTH CAROLINA, CB#3280 COKER HALL, CHAPEL HILL, NC 27599-3280.

The origins of *The Ohio Journal of Science*, the official publication of The Ohio Academy of Science, are traced to its initial forerunner, *The O.S.U. Naturalist*, issued in November 1900. The idea of creating an Ohio natural science journal had been expressed nearly a century ago by members of The Biological Club of The Ohio State University, especially by botanist, William A. Kellerman (1850-1908), who wanted to create a botanical journal. A committee of six individuals from the Club developed a plan of publication for a natural science serial, which after slight modification, was adopted 7 May 1900. John H. Schaffner (1866-1939), botanist, became the Editor-in-Chief, with five associate editors representing different areas of research. The name of the serial changed as its disciplinary scope broadened: *The O.S.U. Naturalist* (November-December 1900); *The Ohio Naturalist* (January 1901-June 1914); *The Ohio Naturalist, and Journal of Science* (November 1914-June 1915); and *The Ohio Journal of Science* (November 1915-present). Since its 1900 issue was printed, the *Journal* has been guided by 18 editors, and has published 97 volumes, two cumulative indexes, and two Special Issues. Among its features are peer-reviewed articles in science, engineering, technology and education or their applications; book reviews; obituaries of Academy members; and Academy Presidential Addresses.

1:45 THE OSU AT MARION CAMPUS NATURE CENTER AND PRAIRIE: 20 YEARS OF CONSERVATION, EDUCATION AND RESEARCH. ROBERT A. KLIPS, DEPT. OF PLANT BIOLOGY, OHIO STATE UNIVERSITY AT MARION, 1465 MT. VERNON AVE., MARION OH 43302.

Prairie plant communities, once plentiful in central Ohio, are now exceedingly scarce. Existing prairie remnants continue to be threatened by development and invasion by exotic species. Interest in prairies is currently high because of their historical and ecological importance. The central feature of the OSU —Marion Campus Nature Center and Prairie is an 8-acre tallgrass prairie established on fallow farmland about 1978 starting with plants and seeds from a natural prairie remnant located nearby, the Claridon Prairie. The prairie is dominated by grasses such as big and little bluestem, switchgrass and Indian grass and forbs including round-headed bush-clover, gray-headed coneflower, tall sunflower and prairie-dock. Several regionally rare plants occur there including state-listed prairie false indigo (*Baptisia lactea*) and royal catchfly (*Silene regia*). A pond and shelter-house have been added to the site and administration of the prairie has been formalized to include a faculty Director and two student Coordinators. The prairie is the focus of a nature education program through which OSU—Marion students interested in teaching visit area schools and also lead tours at the prairie. In addition to its having been a field site for several graduate student and faculty life science studies, ongoing restoration ecology research compares methods of increasing plant diversity. Efforts are underway to enlarge the prairie to 24 acres.

2:00 THE BEGINNINGS OF WRITTEN FLORAS AND TAXONOMIC MONOGRAPHS IN NORTH AMERICAN BOTANY (1800-1840). RONALD L. STUCKEY, HERBARIUM, MUSEUM OF BIOLOGICAL DIVERSITY, OHIO STATE UNIVERSITY, COLUMBUS OH 43212-1192.

Among the first botanical publications of any given geographical area is a list of plants, which is the simplest written flora. The monograph, a comprehensive treatment of the known genera of a family or known species within a genus, provides the names, descriptions, locations, and keys to facilitate their identification. Because of the need for accurate floras, monographic studies became necessary for certain large and/or difficult genera. From 1800-1840, those botanists who were writing floras also prepared the earliest botanical monographs. Examples of botanists who wrote both floras and monographs (cited with name of plant group) were: A. Michaux on *Quercus* (1801); H. Muhlenberg on *Juglans*, *Fraxinus*, and *Quercus* (1801), *Salix* (1806), *Gramineae* (1817); C. S. Rafinesque on *Callictriche* and *Potamogeton* (1811); T. Nuttall on *Eriogonum* (1817); L. D. von Schweinitz on *Viola* (1822) and *Carex* (1824, with J. Torrey, 1825), A. Gray on *Rhynchospora* (1835); and J. Torrey on *Cyperaceae* (1836).

2:15 THE DIVERSITY AND ECOLOGY OF THE PTERIDOPHYTES OF MT. IRAYA & VICINITY, BATAN ISLAND, BATANES, NORTHERN PHILIPPINES. JULIE F. BARCELONA, PHILIPPINE NATIONAL HERBARIUM (PNH), MANILA / BOTANY DEPARTMENT, MIAMI UNIVERSITY, OXFORD OH 45056.

A floristic survey of the pteridophyte flora of Mt Iraya, Batan Island, Batanes Province in the Philippines was conducted in 1990-96. Species richness along an altitudinal gradient was examined, and the conservation status of the taxa determined. Mt. Iraya, an active volcano in the northeasternmost part of Batan Island, is the highest peak (1,009 m) in the province. It occupies an area of 1,248 ha. A total of 96 species were collected, representing about 91% of the total species reported for the province. Of these, ten species are Philippine endemics and eight have strong eastern Asiatic affinities, the Batanes populations representing the southern or eastern limit of their ranges. Recent collection efforts added fifteen new species records for the mountain, one new genus record for the Philippines and one undescribed species. The lowland elevation (0-200 m) is the richest in species composition (38 spp.), while the lower montane forest (ca. 500-900 m) has the largest proportion of endemic taxa. Only three species were recorded at the summit. Nine previously reported species have not been recollected.

2:30 THE DIVERSITY OF VASCULAR PLANTS IN AN ANDEAN CLOUD FOREST RESERVE (MAQUIPUCUNA, ECUADOR). ROBERT M. RHODE & GRADY L. WEBSTER. DEPT. OF BOTANY, MIAMI UNIVERSITY, OXFORD OH 45056 & HERBARIUM, UNIV. OF CALIFORNIA, DAVIS, CA 95616.

The Bosque Protector Maquipucuna forms the core (5000 ha) of a 30,000 ha floristic region on midlevel western slopes of the Andes northwest of Quito, Ecuador. The vegetation, originally lower montane and upper montane cloud forest, is mostly secondary below 1700 m. Floristic inventory from 1989 to 1997, as well as literature & herbarium searches, (c. 4300 collections total), have documented approximately 1460 species of vascular plants, including more than 220 pteridophytes. Naturalized exotics comprise only about 40 species. The flora has a high number of epiphytic taxa represented in 29 families with 340 species, including 90 pteridophytes and 60 hemiepiphytes. Orchidaceae, Araceae, Bromeliaceae, Ericaceae and Gesneriaceae have the largest numbers of flowering plant epiphytes. Above 2000 m, temperate families such as Cornaceae, Cunoniaceae, Hydrangeaceae, Magnoliaceae, and Rosaceae occur, but with few species respectively. Floristic affinities of the Maquipucuna flora appear closest to the Pacific coast cloud forest of the Chocó region in Colombia. Conservation of the Maquipucuna vegetation and flora presents critical problems because of proximity to Quito and continuing development, but efforts are being made by numerous agencies and individuals. The upcoming publication of a detailed checklist for Maquipucuna will be an important step to support this and adjacent reserves of plant diversity.

2:45 INDIGENOUS SWIDDEN AGRICULTURE OF THE WANA WITHIN THE MOROWALI NATURE RESERVE OF CENTRAL SULAWESI, INDONESIA. CYNTHIA L. RICCARDI AND JAN SALICK, DEPT. OF ENVIRONMENTAL AND PLANT BIOLOGY, OHIO UNIVERSITY, ATHENS OH 45701.

Morowali Nature Reserve, established in 1980, encompasses the Wana ancestral homeland. This study documented the swidden cycle of this group of upland agriculturists to understand their presence within and influence on the forest. Community members were interviewed and observed in their gardens. Composition, structure, and diversity of swiddens and house gardens were evaluated quantitatively. Additional sources of food, collected or purchased, and major non-timber forest products were investigated. Unlike other swidden agriculturists, the Wana have less gender-specific tasks, often have conjoining swiddens and concurrent burns, repeatedly fire poorly burned areas, intercrop *Orzya* spp. and *Zea mays*, and rarely plant fruit trees in swiddens. Thus, fallow management is minimal. Younger and older house gardens are more diverse than intermediate gardens due to the presence of fruit trees in the former and dominance of *Manihot esculenta* in the latter. House gardens are more diverse than swiddens. Edible wild plants are gathered yet cultivated plants are preferred. Collection of rattan (*Calamus* spp.) and damar (*Agathis* spp.) provide a limited cash income. Recent governmental efforts to settle the Wana in lowland villages have been largely unsuccessful. However, a few populations, including this study group, have become less mobile, resulting in deleterious effects on the surrounding forest community.

3:00 EFFECTS OF MODIFIED MILPA AGRICULTURE ON SUSTAINABILITY. JAMES A. SPURNEY AND JAMES C. CAVENDER, DEPT. OF ENVIRONMENTAL AND PLANT BIOLOGY, OHIO UNIVERSITY, ATHENS OHIO 45701.

Soil physical and biological characteristics are useful indicators of agricultural sustainability as they relate to soil conservation and crop production. This project examines these indicators as they relate to the Mayan milpa and other farming systems of Belize, Central America. Soil samples were collected from a Mayan milpa farmer's fields in cultivation or in various stages of regeneration, as well as from fields of a large Belizean farm where mechanized techniques and chemical fertilizer are used. Soil samples were analyzed for the following characteristics: 1. Physical - Water Stable Aggregate (WSA) formation using a wet-sieving technique. 2. Biological - A preliminary assessment of endomycorrhizal (VAM) fungi activity by isolation of VAM propagules. 3. Chemical - Soil nutrient analyses for nitrate, ammonium, phosphorus, potassium, organic matter, pH and CEC. Initial assessment for WSA formation indicates that the Mayan milpa may maintain a surface soil structure with more aggregates than the mechanized farm, and similar to that of undisturbed soils. Preliminary assessment for endomycorrhizal fungi indicates that VAM propagules are present in the Mayan milpa soils. Further studies will focus on making a quantitative and qualitative

assessment of the VAM and elaborate on the physical and chemical characteristics of the soils of the two types of farms.

3:15 EFFECTS OF ECOTOURISM ON AGRICULTURE IN A YAGUA VILLAGE IN THE PERUVIAN AMAZON. **Susan R. Lamont, 316 Pearson Hall, Miami University, Oxford OH 45056.**

A growing number of developing countries are embracing ecotourism as a development option that promotes conservation of tropical forests while enabling economic progress. Few studies have documented the effects of ecotourism among other factors transforming rural societies. This study's focus is to determine, through comparison between three villages, the impacts of ecotourism on agriculture in a native Yagua village in the Peruvian Amazon. The objectives are to describe agricultural methods used in each village, and to determine factors influencing agriculture and the effect of each factor. Hypotheses are: 1)shift from a subsistence to a monetary economy leads to decreases in size and number of farm plots, crop diversity, and time allocated to agricultural activities; 2)existence of a market for craft products leads to increased management of certain plant materials, resulting in cultivation and transplant of wild craft species into farm plots. Results of data collected through stratified random sampling of farm plots and interviews with community members supported the first hypothesis but disproved the second. Influence of the tourist craft market in the Yagua village resulted in smaller fields, less crop diversity and less time spent on agriculture, yet craft plants were overexploited from both farm plots and the surrounding forest.

3:30 POLLINATION ECOLOGY OF *PEDICULARIS* IN THE CHINESE HIMALAYA II. **Lazarus W. Macior, Dept. of Biology, University of Akron, Akron OH 44325-3908.**

A study of 14 *Pedicularis* species in the Himalayan alpine meadows of China in 1996 indicated regular pollination by Bombus including species with long, nectarless corolla tubes; moderate pollen-foraging constancy; sympatry of up to 9 *Pedicularis* species in one meadow; absence of putative *Pedicularis* hybrids; microhabitat specificity of *Pedicularis* species and absence of plant-pollinator species specificity. In 1997, pollinator behavior was corroborated by videotape recording. Nectar foragers pollinated nototribically or perforated corolla tubes without pollinating. Pollen foragers on nectarless, long-tubed *P. cranolopha*, *P. longi-flora tubiformis* and *P. longiflora hongyuanensis* pollinated sternotribically. Although pollinators were very scare on Pedicularis, sympatric species of other genera were more frequently pollinated. On Aconitum, 24% of pollinators were monolectic for *Aconitum* pollen, while 67% foraged for nectar only. Queens and workers of at least 5 *Bombus* species pollinated Aconitum. Although Aconitum was locally common, *Pedicularis longiflora tubiformis* exhibited disproportionately greater bloom in many populations blooming sparsely or not at all in the previous season. Despite pollinator sparsity, 48% of *P. l. tubiformis* flowers set fruit. By contrast, 27% of *Pedicularis verticillata* flowers fruited. The data indicate the need for further investigation of the reproductive process in *Pedicularis*.

3:45 NATURAL LEVELS OF POLLEN GRAIN DEPOSITION AND POLLEN TUBE GROWTH IN A WILD POPULATION OF *CLARKIA UNGUICULATA* (ONAGRACEAE). **M. Barbara Nemeth and Nancy L. Smith-Huerta, Dept. of Botany, Miami University, Oxford OH 45056.**

Understanding natural pollen deposition rates and pollen tube growth dynamics in plants forms an integral part of pollination ecology studies and provides important information on some of the factors that affect reproduction in wild populations. Pollen deposition and pollen tube growth levels were surveyed in a wild population of *Clarkia unguiculata* in Northern California. Open pollinated stigmas and styles were collected at 6, 24, and 48 hrs after full stigma receptivity. The total number of pollen grains on the stigma and the number of pollen tubes in the style were counted. Samples harvested at 6 hrs had an average of 61.8 pollen grains on the stigma and 10 pollen tubes in the style/ovary junction. By 24 hrs the average number of pollen grains on the stigma increased to 77.8 and to 22 pollen tubes at the style/ovary junction. At 48 hrs, there were 147.6 pollen grains on the stigma and 49.7 pollen tubes at the style/ovary junction. The average number of ovules per ovary in this population was found to be 101.9. Average seed set in this species is reported to be approximately 60 seeds per ovary, only about 50 % of the available ovules. In this study, enough pollen grains to yield full seed production reached the stigma by 6 hrs after full stigma receptivity. Enough pollen tubes to reach full seed production reached the style/ovary junction by 48 hrs.

4:00 MORPHOLOGICAL CHANGES DURING THE APOMICTIC CYCLE OF *CUPHEA PARSONSIA*. **Melissa A. Luker, (Dr. Shirley A. Graham), Kent State University, Dept. of Biological Sciences, PO Box 5190, Kent OH 44242-0001.**

The change between apomictic and sexual reproduction has been widely studied in a number of plants, like *Antennaria*, but has only recently been discovered in the genus *Cuphea*. In both cases the switch to apomixis is evidenced by noticeable changes in morphology of the flowers. *Cuphea parsonsia* (L.) R. Br. is the focus of this research in which the changes in pollen fertility, stamen number, petal number and color, seed set, and chasmogamy/cleistogamy are being studied in both asexual and sexual flowers from greenhouse and herbarium specimens. *C. parsonsia* flowers all year, and the asexual forms occur in the greenhouse specimens for a period of 2-3 months during the winter. The morphological changes in the apomictic flowers indicate a general reduction in fitness, evidenced by the reduction or absence of stamens or infertile pollen, and a decrease in seed set. Further research is planned to determine whether the change in breeding system is triggered by a change in a specific environmental factor.

4:15 DICTYOSTELID CELLULAR SLIME MOLDS OF ST. JOHN, V.I. **Nicole D. Cavender and James C. Cavender, Dept. of Horticulture & Crop Science, Ohio State University, Columbus OH 43210 & Dept. of Environmental & Plant Biology, Ohio University, Athens OH 45701.**

This research project was designed to study the diversity of cellular slime molds of St. John, V.I., an island of 31 sq. km., 65% of which is vegetationally intact as Virgin Islands National Park. Our interest is in determining what effects area and insular environment have on csm diversity by comparing our data with known csm diversities on Puerto Rico and at Tikal, Guatemala. Soils were collected during August (hot/moist) and December (warm/moist) and processed for csm at Ohio University using a soil dilution-bacterial enrichment technique. In addition to species presence, density and frequency of occurrence were also determined. A total of 1796 isolations, representing 16 species were made from 20 sites in five habitats: moist and thorn forest, agave-cactus and coastal scrub, and white mangrove. Moist forest and agave-cactus scrub had the greatest species richness (11) although densities were greater in moist forest. The number of csm species on St. John is about ½ that of Tikal but only somewhat less than Puerto Rico given data presently available.

4:30 EVOLUTION OF SPORE RELEASE MECHANISMS IN THE SAPROLEGNIACEAE (OOMYCETES). **John Daugherty, Timothy M. Evans, Tally Skillom, Linda E. Watson, and Nicholas P. Money, Dept. of Botany, Miami University, Oxford OH 45056, and Dept. of Biology, Hope College, Holland MI 49422.**

Classical studies on spore release within the family Saprolegniaceae (Oomycetes) led to the proposition that different mechanisms of sporangial emptying represent steps in an evolutionary transition series. We have reevaluated this idea within a phylogenetic framework using ITS sequences of four genera and compared these data with information on the response to osmotic stress shown by each taxon. *Saprolegnia* emerges as the most basal genus, sister to *Achlya*, *Thraustotheca*, and *Dictyuchus*. The stress response of these fungi is compatible with this interpretation. The resulting phylogeny is also consistent with the idea that the mechanism of sporangial emptying exhibited by *Saprolegnia* represents the plesiomorphic condition from which the other mechanisms were derived independently. These alternative mechanisms of spore release may have resulted from a relatively small number of mutations that inhibited axonemal development and altered the temporal and spatial expression of wall-loosening enzymes.

SESSION 05

Forest Ecology

09:00AM Saturday, April 4, 1998

Johnston Hall 106

Frederick John Kluth - Presiding

9:00 TWENTY YEARS CHANGE IN TREEFALL GAPS AND CANOPY TREES IN HUESTON WOODS, OHIO. **James R. Runkle. Department of Biological Sciences, Wright State University, Dayton OH 45435.**

My goal is to quantify the dynamics of the old-growth beech-maple forest in Hueston Woods, Ohio. In 1997 I resampled areas first sampled in 1977, collecting two sorts of data: 1) vegetation (>1 m tall) and other characteristics associated with 36 gaps caused by the death of large branches, single canopy trees or small groups of canopy trees and 2) 507 canopy (>25 cm dbh) trees measured using the point-centered quarter method along the same transects used for sampling treefall gaps. Gap vegetation varied with gap age, location within the woods, topographic position, orginal size of gap, and whether the gap had been redisturbed. I resampled the point-centered quarter trees for growth and mortality. I included new trees where appropriate (e.g., if original tree had died), to estimate changes in species importance. Annual mortality rates were 1.3% from 1977-1997. Mortality rates increased with stem size. Annual mortality for American beech was 2.4% from 1977-1997 versus 0.5% for sugar maple. Beech decreased in relative density (-8%) and relative basal area (-14%) whereas sugar maple increased (+11%, +10%). Thus, even in an old-growth forest longterm changes in species importance have occurred.

9:15 THE STRUCTURE AND DYNAMICS OF AN OLD-GROWTH WOODS IN THE HOLDEN ARBORETUM. **Jodi A. Forrester and James R. Runkle, Dept. of Biological Sciences, Wright State University, Dayton OH 45435.**

Several multi-tree blowdowns and branch dieback appear to be thinning the canopy in an old-growth *Fagus grandifolia-Acer saccharum* natural area of the Holden Arboretum. Beech bark disease is a potential disturbance that has recently spread into the forests of Northeastern Ohio. We asked if one forest was currently maintaining itself or if it was beginning to suffer from these introduced stresses. First, ordination techniques were used to measure the variation within the forest. Second, mortality and growth rates were calculated to determine variations among woodlots, species and stem sizes. Finally, we examined whether the present replacement patterns within these woods maintain the current canopy and understory composition. Previously established transects were remeasured. Within the largest *Fagus-Acer* stand, 100m² plots were established along the transects beneath both closed and open (gap) canopies. The number of woody stems and the volume and biomass of the coarse woody debris within these plots were measured. The rates for mortality (2.3% /yr) and growth (3 mm dbh/yr) are comparable to other old-growth deciduous forests of the region. Both *Fagus* and *Acer* were found to be replacing themselves within the plots. The volume (104 m³/ha) and biomass (31 Mg/ha) of coarse woody debris fall within the ranges of values reported for temperate deciduous forests.

9:30 HERBACEOUS SPECIES AS KEYS TO DEFINING OLD-GROWTH FORESTS OF SOUTHCENTRAL ALASKA. Tara S. Fletcher and John L. Vankat, Dept. of Botany, Miami University, Oxford OH 45056.

There is no universal definition for the term "old growth" forest because old-growth properties are specific to location. Alaska has two well-known forest types, the Coastal and Interior forests. A third, poorly-studied type occurs in southcentral Alaska where climatic conditions are unique. Old-growth forests in this area are composed of only two species, white spruce (*Picea glauca*) and paper birch (*Betula papyrifera*). However, herbaceous species richness is much greater. Therefore, herbs may provide additional, if not greater, insight into these forests. During the summer of 1997, we utilized 18 20 x 25m study plots on Fort Richardson Army Base near Anchorage to determine whether some herbaceous species uniquely characterize old-growth forests of southcentral Alaska. The plots were located to encompass various landforms and stand age classes. Percent cover estimates were conducted on 1 x 1m subplots approximately every three weeks throughout the growing season. Findings indicate that the presence or absence of herbaceous species is consistent across forest ages. However, species abundances are variable and therefore aid in defining "old growth" for this region.

9:45 THE EFFECT OF CAMERA HEIGHT ON THE ANALYSIS OF FOREST CANOPY HEMISPHERICAL PHOTOGRAPHS. Scott A. Robison and Brian C. McCarthy, Dept. of Environmental and Plant Biology, Ohio University, Athens OH 45701.

With the increased availability of digital technology, hemispherical photography is becoming increasingly popular as a method of documenting forest canopy cover. Subsequent computer analysis of digitized images provides reasonably accurate and precise estimates of the amount of seasonal solar radiation reaching the forest floor. Presently, most published studies have utilized a camera height of 1.5 m. A camera height closer to the ground may better describe the light patterns available for seedlings and more precisely account for light conditions generated by forest floor disturbances such as low intensity fires. Thus, the present study was designed to evaluate the effect of taking photographs at heights of 30 and 150 cm in 36 plots of mature mixed oak forest in southern Ohio which had exhibited different burn treatments. Of the 36 plots, 12 each were from three different fire treatments: control (no burn), infrequently burned (every three years), and frequently burned (yearly). Overall, the mean difference between the 30 and 150 cm photographic positions was only 1.21 percent of full seasonal global radiation. When the camera position was lowered, 21 plots increased in value and 15 plots decreased in value. No significant differences were found for the overall position effect ($P > 0.977$) or between positions within any of the burn treatments ($P > 0.533$; $P > 0.574$; $P > 0.858$; respectively).

10:00 COMPOSITION, STRUCTURE, AND HEALTH OF DYSART WOODS, AN OLD-GROWTH MIXED MESOPHYTIC FOREST OF SOUTHEASTERN OHIO. Brian C. McCarthy and Christine J. Small, Dept. of Env. and Plant Biology, Ohio University, Athens, OH 45701.

Dysart Woods retains National Natural Landmark status because of its virgin white oak and mixed mesophytic vegetation. The overall purpose of this research was to establish a long-term study of forest and soil dynamics in an unmanaged forest. Here we report the baseline results of woody vegetation composition, structure, and health. Two 0.35 ha permanent plots (50 x 70 m) were established on opposing north- and south-facing slopes. All live trees (dbh$\geq$ 2.5 cm) within each plot were identified, tagged, and mapped. Saplings (dbh < 2.5 cm, ht $\geq$ 30 cm) and seedlings (ht < 30 cm) were sampled in 35 sub-plots within each main plot. Sixteen tree species were encountered. The south plot (BA = 35.9 $m^2 \cdot ha^{-1}$, DEN = 920 stems$\cdot ha^{-1}$) was dominated by *Fagus grandifolia*, *Quercus alba*, and *Acer saccharum*. The north plot (BA = 32.5 $m^2 \cdot ha^{-1}$, DEN = 971 stems$\cdot ha^{-1}$) was dominated by *A. saccharum* and *F. grandifolia*. Stand-level diameter distributions were of the reverse-J form typical of old-growth forests; however, certain species distributions departed significantly. For example, many (40-50%) of the oldest *Q. alba* trees are in a state of severe decline and are not regenerating. *F. grandifolia* and *A. saccharum* are well represented in all size classes. Forest health assessment based on bole damage, crown transparency and dieback, foliage characteristics, and vigor suggests that the forest is otherwise healthy.

10:15 DISTRIBUTION, ABUNDANCE, AND DYNAMICS OF COARSE WOODY DEBRIS IN DYSART WOODS, AN OHIO OLD-GROWTH FOREST. Darrin L. Rubino and Brian C. McCarthy, Dept. of Env. and Plant Biology, Ohio University, Athens OH 45701.

Coarse woody debris (CWD), snags, and stumps serve numerous functions in the forested ecosystem. These functions vary through stand development and succession. Due to the structure of old-growth forests, it is hypothesized that the input rate of wood volume should be relatively small and in moderate to advanced stages of decay. The purpose of our study was to test these two hypotheses. CWD abundance patterns also permit inference regarding the ambient disturbance regime. We identified and mapped all CWD (boles or branches $\geq$ 10 cm), snags, and stumps in two 0.35 ha permanent plots on opposing north- and south-facing slopes (N & S) in Dysart Woods, a remnant tract of deciduous old-growth forest in SE Ohio. We examined the species identity, age, diameter class, and decay state distributions of the dead wood components in relation to the live vegetation. CWD volume was 203.9 and 131.1 $m^3 \cdot ha^{-1}$ in the N and S plots, respectively. Stump density was equal in both plots (14.3 stumps$\cdot ha^{-1}$); snag density in the S plot (22.9 snags$\cdot ha^{-1}$) was twice that of the N plot (11.4 snags$\cdot ha^{-1}$). In both plots, the diameter distributions of the CWD and live stems exhibited a reverse J-shape distribution and were not significantly different (K-S test; $P = 0.418$ and $P = 0.787$, respectively). The majority of the CWD (87% and 71% in the N and S plots, respectively) was in an advanced state of decay. These findings also confirm gap dynamics as the primary mode of disturbance in this forest.

10:30 COMPOSITION AND DIVERSITY OF FOREST HERBS IN DYSART WOODS, AN EASTERN MIXED-MESOPHYTIC OLD-GROWTH FOREST. Christine J. Small and Brian C. McCarthy. Department of Environmental and Plant Biology, Ohio University, Athens, OH 45701.

The composition and diversity of herbaceous vegetation was examined at Dysart Woods, a 23-ha mixed-mesophytic old-growth forest in Belmont County, Ohio. As one of the largest known remnants of original forest in southeastern Ohio, Dysart Woods represents a unique opportunity to investigate the composition and dynamics of understory herbaceous communities in an unmanaged forest. Thirty-five permanent 2.0 m^2 plots were systematically established on opposing north- and south-facing slopes. Percentage cover was determined for all herbaceous vascular plant species in the sample plots during April, June, and August 1997. Fifty-three species were identified. Species dominating the north slope included *Claytonia virginica*, *Impatiens pallida*, *Osmorhiza claytonii*, and *Viola pensylvanica*; the south slope was dominated by *C. virginica*, *O. claytonii*, *Aster divaricatus*, and numerous graminoids. North plots generally had greater total plant cover. Species proportion models indicate a relatively diverse understory on the south slope ($S = 31$, $H' = 2.82$, $D = 13.2$), with levels comparable to other central Appalachian old-growth forests. The understory of the north slope was comparatively impoverished ($S = 18$, $H' = 2.15$, $D = 6.82$). Evenness values ($E = 0.554$, 0.486) suggest fairly inequitable abundance of species on both slopes. Our study plots contained only species native to the eastern US, suggesting Dysart Woods may be an important reservoir for biological diversity.

10:45 DYSART WOODS: A WINDOW TO THE PAST AND A VISION OF THE FUTURE. Ray R. Hicks, Jr. Division of Forestry, P.O.Box 6125, West Virginia University, Morgantown, WV 26505.

Dysart Woods is a remnant old-growth oak forest in Belmont Co. These remnants represent the potential fate of extensive areas of today's central hardwood forests, in the absence of anthropogenic impacts. Thus, it is important to study old-growth remnants, both from an historical perspective as well as representations of possible future development of current second-growth forests. I established 36 sampling locations in the old-growth areas and collected data from both fixed-area plots and point-samples. In addition, 100% of the large trees (>28" dbh) were measured, including standing dead. From these samples, numbers of seedlings and trees was computed by diameter and species. In addition, data were used to calculate importance values and Shannon's H' diversity index. I also developed a life table for the residual white oaks, the predominant species in the overstory. Results indicate that the overall diameter distribution is typical of all-age forests, but individual species (eg. white oak) had diameter distributions typical of even-age forests, while others possessed typical all-age distributions (eg. sugar maple). Regeneration was predominantly sugar maple, and this species has been increasing in importance at the expense of species like white oak. Oak regeneration was virtually absent. Using the life table approach, it was forecast that maple and American beech will form over 95% of the canopy at Dysart Woods in approximately 200 years. Species diversity as measures by H' averaged about 1.7, which is somewhat below that reported for other old-growth central hardwood forests. This may be due to the aggressive influx of sugar maple in this forest. This study provides insight into the probable role of disturbance in the initiation of Dysart Woods, and provides a view of how present-day oak forests may develop in the absence of major disturbance.

SESSION 06

Land Animal Ecology

01:30PM Saturday, April 4, 1998

Johnston Hall 119

Alan B. Cady - Presiding

1:30 PRELIMINARY REVIEW OF THE STATUS OF OHIO'S LAND SNAILS. Michael A. Hoggarth, Department of Life and Earth Sciences, Otterbein College, Westerville OH 43081.

One hundred and thirty seven species of land snails (Mollusca: Gastropoda: Pulmonata) have been recorded from Ohio. Of this total, ten species are of questionable occurrence in the state and six have been introduced. The status of the remaining 121 species is the focus of this study. Over the past ten years, 319 collections, from most of Ohio's 88 counties, have yielded new county records for Ohio land snails. These collections combined with the examination of Ohio specimens at the Field Museum of Natural History (Leslie Hubricht Collection), the National Museum of Natural History, and The Ohio State University Museum of Zoology has resulted in a better understanding of the distribution of these animals in Ohio. Currently, 32 species of land snails have been recorded from five or fewer counties and 19 additional species occur in only six to ten counties. Of these 51 species, 20 occur in restricted ranges outside of Ohio. A list of rare species, along with criteria used to establish endangered, threatened and special concern status for these molluscs will be presented.

1:45 SPIDERS IN SOYBEAN FIELDS: THE IMPORTANCE OF HEDGEROWS AND EDGE PERMEABILITY ON THEIR MOVEMENTS. Alan B. Cady & Juraj Halaj, Dept. of Zoology, Miami University, 4200 E. University Blvd., Middletown OH 45042.

The significance of field margins - hedgerows - as reservoirs harboring many generalist predators migrating into adjacent crop fields has been a topic of numerous research studies.

However, the role of spiders in these processes and factors modifying their movements between hedgerows and fields are much less understood. Two soybean fields were sampled for ground spiders from the stage of soy germination (May) through harvest (November) using a 8x8m grid of pitfall traps extending from within the hedgerow, across the ecotone, into the field. One field had an abrupt ecotone and the other had a 16-m wide grassy strip between the hedgerow and the soybean field. Certain spider groups preferred the hedgerow while others were found more commonly in the field, but these relationships changed with the growing season. Our pitfall trap data suggest that spiders move through the abrupt ecotone more easily (more "permeable") compared to the edge with grassy strip, which appears to impede their dispersal from the hedgerow into the soybean field (less "permeable"). Mark-recapture experiments confirmed movements of some spider species across the ecotone. Ongoing hedgerow manipulations are testing the observed patterns of spider movement. These data suggest that hedgerows may serve as critical habitat refugia for many spider species seasonally migrating into crop field. Thus, protecting these habitats in the agricultural landscape may conserve the local spider fauna and enhance their role as agents of biological control.

2:00 A COMPARISON OF SPIDER (ARANEAE) DIVERSITY BETWEEN SOIL/ LITTER STRATUM AND UNDERSTORY VEGETATION OF SELECTED FOREST SITES IN OHIO. **Richard A. Bradley, Ohio State University, 1465 Mt. Vernon Ave., Marion OH 43302.**

This study is part of a larger effort to determine the species diversity, distribution and abundance patterns of spiders in Ohio funded by the Ohio Division of Wildlife. Spider communities were sampled at Conkle's Hollow Natural Area (Hocking Co.),Glen Helen Outdoor Education Center (Greene Co.), Fowler Woods Natural Area (Richland Co.), Seymour Woods Natural Area (Delaware Co.) between May 1994 and October 1997. Sampling methods included visual search, beating sheet, sweep net, pitfall trap, and litter extraction. Species diversity in the soil/litter stratum was higher than in the understory vegetation at each site. Each sampling method captured a number of species not represented in other samples; 45% of species were captured by only one method and an additional 35% of species were captured by only two of the five methods. Visual search at ground level, litter extraction and pitfall traps captured a higher proportion of unique species than the other sampling methods. Despite a considerable sampling effort to date, species-accumulation plots indicate that many species remain to be documented from each of the study sites.

2:15 STRAW SHELTERS ENHANCE THE ABUNDANCE AND DIVERSITY OF SPIDERS IN A SOYBEAN AGROECOSYSTEM. **Alan B. Cady, Juraj Halaj & George W. Uetz, Dept. Zoology, Miami University, Oxford OH 45056.**

The use of generalist predators as biocontrol agents in agroecosystems has become a popular area of current Integrated Pest Management research. The use of straw shelters to conserve populations of generalist predators such as spiders during the time of agricultural disturbance has been practiced by farmers in the Far East for over 2,000 years. This technique, however, has not been systematically investigated. We studied the use of straw shelters as temporary habitat refugia for ground-dwelling spiders following a major disturbance - conventional tillage - in a soybean field system. Modular habitat refugia (= "straw baskets", 50 x 80 x 20cm) constructed of chicken wire loosely filled with bedding straw were placed in the field immediately following tillage. Two weeks after, 37 times as many spiders and their egg sacs were hand-collected from straw baskets compared to bare ground. The bare ground spider community was dominated by wolf spiders (Lycosidae; 40.9%), small sheet-line weavers (Linyphiidae 36.6%), and nocturnal running spiders (Gnaphosidae 10.8%). A more diverse spider assemblage, however, was found in straw baskets lead by small sheet-line weavers (Linyphiidae 37.8%) followed by jumping spiders (Salticidae 21.1%), wolf spiders (Lycosidae 18.4%), and sac spiders (Clubionidae 12.1%). Soybean seedlings near habitat refugia suffered significantly less insect damage than those at control locations in the open field. We suggest that this technique may promote the establishment and reproduction of spiders in agroecosystems, thus providing a simple measure of insect biocontrol.

2:30 CAPTIVE REARING OF THE HARLEQUIN BEETLE (COLEOPTERA: CERAMBYCIDAE) AT THE CINCINNATI ZOO, INCLUDING USE OF AN ARTIFICIAL LARVAL DIET. **Janet L. Stein Carter, Clermont College -University of Cincinnati, 4200 College Drive, Batavia OH 45103.**

Harlequin Beetles, *Acrocinus longimanus* (Linn.), were successfully reared through two generations in captivity at the Cincinnati Zoo utilizing freshly-cut mulberry logs (*Morus sp.*) as the host plant. It was shown that mulberry is a suitable host plant to stimulate oviposition, eclosion, larval development, and pupation. Neither older, dried mulberry logs nor frozen-then-thawed logs are acceptable oviposition sites. Of nine first-generation larvae raised on mulberry, six reached adulthood, with four (one male and three females) living to reproduce. Over 100 offspring were obtained from these females. Twenty of the second-generation larvae were reared on mulberry, while the rest were reared on an artificial diet consisting of Vanderzant-Adkisson Wheat Germ Diet, fresh mulberry sawdust, and morin (an analytical reagent, 2-(2,4-Dihydroxyphenyl)-3, 5, 7-trihydroxy—4H-1-benzopyran-4-one, extracted from Brazil wood, *Chlorophora tinctoria* (Linn.), and used here as a phagostimulant) suspended in an agar medium.

2:45 CASTE ALLOCATION OF RADIO-LABELED FOOD IN COLONIES OF THE ANT, *APHAENOGASTER RUDIS*. **E. Raymond Heithaus and Jeremy M. Bono, Biology Dept., Kenyon College, Gambier OH 43022.**

The ultimate indicator of ant colony fitness is the number of reproductives (males and queens) the colony produces. Even within a species, colonies vary in allocation to males and females. Currently, two hypotheses have been proposed to explain what determines sex ratios in colonies. The genetic relatedness theory argues that there is a genetic conflict of interest between queens and sterile workers. The resource dependent theory argues that since queens are much larger than males, colonies with access to an abundance of resources should produce more queens while colonies with limited access to resources should invest in males. Previous evidence suggests that sex allocation for colonies of the ant, *Aphaenogaster rudis*, is best explained by the resource dependent hypothesis. Colonies given more elaiosomes (a food from a plant mutualism) produced more queens then control colonies. However, it is unclear how more elaiosomes result in more queen production. We used radio-labeled food to measure allocation of food among castes, comparing elaiosomes and insect larvae. In lab colonies elaiosomes are preferentially distributed to the queen, while males and gynes (virgin queens) also receive more than workers. In contrast, meal worms are not allocated preferentially among castes. Workers did not discriminate against males, even though males usually exceeded numbers predicted by the genetic relatedness theory. We conclude that *Aphaenogaster rudis* colonies distribute elaiosomes differently than insect food, and this might be a mechanism by which resources influence the production of reproductive castes.

3:00 EFFECT OF HABITAT SCALE ON INVENTORY OF MICHIGAN *PAPAIPEMAS* (LEPIDOPTERA:NOCTUIDAE) **Keith S. Summerville. 319 North Elm Street, Oxford OH 45056.**

The Noctuid genus *Papaipema* is a diverse assemblage of moths whose larvae are all borers. Adults appear from late August to mid October but are rarely found in collections due to their low activity level. Members of this genus are poorly studied, but their diversity warrants conservation. Surveys for Papaipemas were conducted using UV and mercury vapor lighting techniques during the fall of 1997. All surveys were conducted on Michigan Nature Conservancy preserves which were known to support large densities of suitable host plants. Since host plant abundance was not limiting and records indicated historical collections from each site, many Papaipemas were expected. However, after one month of intensive sampling, few rare moths were found. When the focus of the search shifted to an examination of microhabitat variations within a host plant patch, collection of rare species increased. This suggests that land managers and field biologists need to focus on smaller scales when considering rare moths. Lack of insect species' occurrences from one location within a community may not signify complete species absence.

3:15 FLIGHT VELOCITIES OF ODONATA MEASURED USING VIDEO TECHNIQUES. **Candace Tuxhorn and Dave McShaffrey, Biology Department, Marietta College, Marietta OH 45750.**

While a number of recent studies have led to a better understanding of dragonfly flight, few studies have reported on that flight in natural situations. Studies that have been done under natural situations have typically treated only a few individuals monitored for a brief period of time. This study reports on flight segments recorded of individuals of six species near Marietta, OH, on June 16, 1997 and July 11 & 14, 1997. A Panasonic Palmsight PV-1557 16X Optical Zoom video camera was used to record the dragonfly flight. The videos were taken between the times 1-4 pm. Tapes were analyzed by tracing frame-by-frame movements of specimens from a monitor to transparency. Magnification on the monitor was related to actual distances in the field by reference to a meter stick, which had been placed in the field of view while recording. The distance a specimen flew between frames was calculated by measuring the on-screen distance and dividing by the magnification factor. The distance was multiplied by the time between frames (0.03 sec.) to determine velocities. Average flight velocities of six species was 1.40 ms^{-1} (n=3399) (σ=0.05). There was a significant difference between three of the six species. The technique described here is simple, inexpensive, and widely adaptable to behavioral studies of a wide range of animals.

3:30 A SURVEY OF THE BIRDS AT OHIO NORTHERN UNIVERSITY, ADA, OHIO. **Jennifer T. Matthews (Dr. Nelson J. Moore), Dept. of Biological Sciences, Ohio Northern University, Ada OH 45810.**

With the increase in suburban sprawl, human residentially-managed habitats are becoming increasingly important. An excellent example of such an environment is the campus of Ohio Northern University, Ada, Ohio. The campus was subdivided into four distinct equal-sized habitats: old campus, new campus, woodland/ponds, and playing fields. Twenty-eight transect surveys measuring species richness and diversity were conducted through all habitats between May 20 and December 21, 1997, each lasting about 1.5 hours. Data were analyzed using the Simpson Species Diversity Index. Certainty of breeding was noted using a standard nesting breeding status code system and nest site locations were identified using the Global Positioning System (GPS). Preliminary results record 49 species and indicate that as hypothesized, species richness and diversity were significantly different among the four habitats. This study will serve as a baseline of comparison for other avian studies on campus that may be conducted after inevitable future habitat changes.

3:45 THE FORAGING ECOLOGY OF CAPTIVE, FREE-RANGING BACTRIAN WAPITI (*CERVUS ELAPHUS BACTRIANUS*) AND RETICULATED GIRAFFE (*GIRAFFA CAMELOPARDALIS RETICULATA*) AT THE WILDS CONSERVATION FACILITY IN CUMBERLAND, OHIO. **Krista M. Wenning (Linda C. Zimmerman and Juliana C. Mulroy). Denison University, Granville OH 43023.**

The foraging activities of captive, free-ranging Bactrian wapiti (*Cervus elaphus bactrianus*) and reticulated giraffe (*Giraffa camelopardalis reticulata*) were studied at the Wilds conservation facility in Cumberland, Ohio (Muskingum county). Observing the behavior of these non-native animals to novel forage may provide insight into the evolution of foraging behavior and diet selectivity as well as provide information of pragmatic importance to conservation facilities attempting to maintain and reproduce endangered and threatened species. Study animals freely grazed or browsed upon forage available in the approximately 8 ha. enclosure containing a variety

of native and introduced vegetation. Direct observation was employed to study the individuals. Vegetation samples were collected from all of the forage items and analyzed according to standard methods to quantify gross energy as well as water, fiber and nitrogen content. Biomass was estimated by systematically sampling along transects throughout the enclosure. Over the 13-week study period, giraffe were observed foraging upon a total of 30 forage items and wapiti were seen consuming 24 items. The majority of the giraffe forage items were trees or shrubs, with few vines and low lying herbaceous plants included in the diet. The wapiti diet seemed to be more inclusive of low lying forage material. Black locust (*Robinia pseudo-acacia*) appeared to be the preferred forage item for both species.

SESSION 07

PLANTS: MOLECULAR SYSTEMATICS; INVASIVE SPECIES

09:00AM SATURDAY, APRIL 4, 1998

JOHNSTON HALL 108

MICHAEL S. BARKER - PRESIDING

9:00 THE HISTORY OF AN AMERICAN ELM: VERIFICATION OF ORAL TRADITIONS USING DNA MARKERS. MICHAEL S. BARKER, DENISON UNIVERSITY, SLAYTER BOX 327, GRANVILLE OH 43023.

Randomly amplified polymorphic DNA (RAPD) markers from polymerase chain reactions (PCR) were used to construct limited DNA profiles of 12 selected American elms in a blind experiment. Most of the American elms sampled were 60 year old trees growing along Washington Rd. in Princeton, NJ, which were rumored to be clones of a Dutch elm disease (DED) tolerant American elm cultivar, the 'Princeton Elm.' In addition, a 200+ year old tree in the Princeton cemetery was rumored to be the maternal parent of the 'Princeton Elm.' Seven of the Washington Road American elms had DNA profiles identical to those of a known 'Princeton Elm.' The other samples and DNA profiles from 2 Ohio trees were shown to be related to the 'Princeton Elm' clones after analysis with the RAPDistance v.1.04 computer program, but with varying degrees of genetic distance. The RAPD-PCR method is a quick and easy method for the identification of American elm cultivars.

9:15 GENETIC DIVERSITY AND GENE FLOW OF TURTLE GRASS, *THALASSIA TESTUDINUM*, BANKS EX KÖNIG, IN THE LOWER FLORIDA KEYS. MARK A. SCHLUETER AND SHELDON I. GUTTMAN, DEPT OF ZOOLOGY, MIAMI UNIVERSITY, OXFORD OH 45056.

Turtle grass is the dominant seagrass in the very productive and valuable coastal seagrass community. The present study investigated the genetic diversity of turtle grass collected at 18 sites in the lower Florida Keys. Fourteen allozyme loci were resolved, of which 5 (ADH-2, GPI, LAP, 6-PDGH, and PGM-2) were variable. Mean heterozygosity = 0.027. The majority of genetic diversity occurred within populations (G_{ST} = .050). The number of migrants each generation (N_m), an estimate of gene flow, was calculated using Wright's F-statistics. The F-statistics yielded a N_m = 24.8 for sites within the same area, N_m = 3.9 for adjacent sites (within 4 km), and a N_m = 1.0 among all 18 collection sites. These results indicated strong gene flow for sites that were adjacent, but not at a distance > 4 km. A stepping stone model closely predicted (p = 0.0015) turtle grass gene flow; physical adjacency of sites had a greater effect than geographic distance. The majority of other studies dealing with seagrass species have found little to no genetic variation; however, the present study has documented genetic variation in turtle grass at five allozyme loci. This variation suggests that sexual reproduction may significantly contribute to *T. testudinum*'s genetic structure and evolution. However, overall genetic diversity was relatively low across all sites, indicating a trend towards genetic uniformity of turtle grass in the lower Florida Keys. This genetic uniformity may have contributed to the large turtle grass die-offs in recent years.

9:30 MOLECULAR ANALYSES REVEAL GENETIC SIMILARITY OF *ACER SACCHARUM AND ACER NIGRUM*. ADAM P. SKEPNER & DAN E. KRANE. WRIGHT STATE UNIVERSITY, DEPT. OF BIOLOGICAL SCIENCES, DAYTON, OH 45435.

The number of species and subspecies that comprise North American sugar maples has remained in dispute since their first characterization over 100 years ago. The distinction between *Acer nigrum* (black maples) and *Acer saccharum* (sugar maples) in particular has been controversial. Despite readily distinguished morphologies and different adaptive advantages, these trees hybridize readily and their ranges extensively overlap. Extensive RAPD-PCR based analyses of *A. nigrum* and *A. saccharum* trees collected from throughout their range reveals that they are genetically distinguishable only on a geographical basis and not by their morphologies. The extent to which locally collected, indigenous trees displaying the characteristic *A. nigrum* and *A. saccharum* morphologies are genetically indistinct seriously undermines the basis for assigning distinguishing species names to these trees. The distinctive characteristics of these trees may be affected by a relatively small set of genes or may even constitute inducible responses on the part of trees to their local environments.

9:45 A 16 KDA PROTEIN IN THE CYANOBACTERIUM, SYNECHOCYSTIS SP PCC 6803 PLAYS A ROLE IN THE HEAT SHOCK RESPONSE. SENGYONG LEE, DANIEL J. PROCHASKA, FENG FANG, AND SUSAN R. BARNUM. DEPARTMENT OF BOTANY, MIAMI UNIVERSITY, OXFORD, OH 45056.

Heat shock proteins (HSPs) are involved in protecting cellular structures and processes from heat stress. Through comparisons of genomic sequence data (Kaneko, T. et al. 1996. Plant Cell Physiol. 37 (suppl): 551), and conserved gene sequences of the HSPs, a putative HSP16 gene was identified and cloned from a cyanobacterium, *Synechocystis sp.* PCC 6803. This putative gene was isolated using PCR and cloned into the pGEM plasmid. The response of the gene to heat shock was examined by Northern blot analysis and it showed a significant increase in RNA transcription, when cells were exposed to 42°C. This data indicates that the HSP16 is a heat shock gene. To determine the role that HSP16 plays in the heat shock response, a mutant cell line that lacks a functional HSP16 was generated. Inactivation of the HSP16 gene in cyanobacteria mutants was verified through Northern blot analysis. Oxygen evolution rates have been measured in wild type and mutant cells after heat shock. Results show a 30-40% reduction in oxygen evolution rates in the mutant cells after heat shock treatments. Cell growth rates between wild type and mutant cells have been compared after exposure to heat shock. Results show 40% decreased cell growth rates in mutants. These data indicate a major protective role for HSP16 in the heat shock response.

10:00 INVASIVE POTENTIAL OF THE NON-NATIVE *PAULOWNIA TOMENTOSA* IN A MANAGED FOREST LANDSCAPE. A. CHRISTINA WILLIAMS AND BRIAN C. MCCARTHY, DEPT. OF ENVIRONMENTAL AND PLANT BIOLOGY, OHIO UNIVERSITY, ATHENS OH 45701.

Two factors are important in non-native plant establishment in ecosystems: the susceptibility of the ecosystem to invasion and characteristics of the invader which allow it to invade. Disturbance is hypothesized to increase habitat susceptibility to invasion. It is assumed that successful non-native species are good competitors and their success may be due to a lack of natural herbivores in new habitats. We transplanted *Paulownia tomentosa* seedlings, a fast-growing tree native to China, in plots that were cleared of vegetation or left unmanipulated in replicated transects through six different 5yr old clear cuts, forest edge, and intact forest areas. In half of the sites, 16 plants were planted in pots and 16 had no pot (to test for below-ground competition). We compared the growth and survival of plants over the growing season. We found 72% of all plants were top-killed by rabbits at harvest in late September. Herbivory was patchy over the six sites. Higher survival was found in forest plots with equal survival rates in edge and clear cut plots. Relative growth rates were higher in plants with pots, but cleared plots and location along transects (clear cut, edge, or forest) had no significant effect. We expected that disturbed sites (clear cuts and possibly edge sites) would show higher survival and growth rates of plants. However, intact forest sites had higher survival and growth rates. Also contrary to theory, herbivores significantly decreased survival. Only below-ground competition reduced growth rates of plants.

10:15 EFFECTS OF DENSITY AND RESOURCE HETEROGENEITY ON THE GROWTH OF AN INVASIVE BIENNIAL (*ALLIARIA PETIOLATA*, BRASSICACEAE). J. FORREST MEEKINS AND BRIAN C. MCCARTHY, DEPT. OF ENV. AND PLANT BIOLOGY, OHIO UNIVERSITY, ATHENS OH 45701.

Variation in resource availability within a habitat can influence plant survival, growth, and fecundity and affect a plant's ability to colonize and spread in to new habitats. *Alliaria petiolata* (garlic mustard) is an invasive biennial herb that often invades floodplains and upland forests in North America. The goal of this study was to assess the effects of high, medium, and low light levels (0%, 50%, or 90% shade); high, medium, and low nutrient levels (0g, 5g, or 10g fertilizer added per 0.05m^2); and high and low plant density (1 or 10 plants per 0.05m^2) on the growth of *Alliaria*. *Alliaria* seedlings were transplanted into pots in an experimental garden and randomly assigned to 1 of 18 possible treatment groups. At the end of the season, the number of leaves and primary root length were measured for each rosette plant, plants were harvested, dried, and weighed. Three-way ANOVAs showed a significant effect of density, fertilizer, and shade on all of the dependent variables measured. Low plant density, low and medium shade conditions, and high and medium fertilizer levels all positively affected plant growth. It appears that for *Alliaria*, increased light availability, a trait often associated with forest disturbance, may be more important than site quality in influencing plant growth.

10:30 THE POTENTIAL DANGERS FROM CULTIVATED WOODY PLANTS TO NATIVE BIODIVERSITY. MICHAEL A. VINCENT, DEPT. OF BOTANY, MIAMI UNIVERSITY, OXFORD OH 45056.

Hundreds of species of non-native woody plants are used in Ohio as ornamentals. While many of these species seem to pose no threat, since they do not seem to spread, many other species may indeed pose a slight or even serious threat to native flora and fauna as they escape and invade areas to which they are not native and where they were not planted. Surveys of local woodlots in southwestern Ohio and searches through the herbaria of the state have revealed that many taxa not previously thought to escape from cultivation are indeed doing so. Some of these species may pose a serious threat to native woodland species. While the threat of Amur honeysuckle (*Lonicera maackii*) is well-documented, few people realize that other commonly planted woody ornamentals are appearing in areas where they were not planted. One very commonly planted species which may soon become a serious problem is Burning bush (*Euonymus alatus*), which is appearing more and more frequently in surveys of woodlots. In some areas, it is nearly as dominant as is Amur honeysuckle. Another species of concern is Norway maple (*Acer platanoides*), widely planted as a lawn or street tree, and now escaping widely. In some woodlots, trees of this species have reached the canopy and are reproducing. Another 40 to 50 species are commonly cultivated which could escape and become problematic.

10:45 SEED DORMANCY IN GARLIC MUSTARD, *ALLIARIA PETIOLATA* (BIEB) CAVARA AND GRANDE. DANIEL R. SCOTT & EMILIE E. REGNIER, GRADUATE RESEARCH ASSISTANT & ASSOC. PROFESSOR, DEPT. OF HORTICULTURE & CROP SCIENCE, OHIO STATE UNIVERSITY, COLUMBUS OH 43210.

Garlic mustard is a pernicious weed of forest under story that may crowd out many desirable spring ephemerals. Occurring in only 1 county in 1932, it is now found in at least 57 of Ohio's 88 counties. Garlic mustard is a strict biennial that produces a large seed drop in its second year. Newly harvested seeds have a strong innate dormancy that is not broken by scarification. During the freeze-thaw cycles of winter, this dormancy breaks down allowing a flush of seedlings to appear in late winter and early spring. A buried seed dormancy experiment was initiated to determine when garlic mustard seeds become germinable and how long they remain viable. Lots of 170 seeds in 6cm square packets of permeable fiberglass mesh were buried in a 2 sq.m. plot in a mixed deciduous forest with 3 replications at two depths: 0.5cm and 10cm. Packets were retrieved monthly and seeds that germinated were removed and counted. Remaining seeds were germinated at 15/6 degree C on a 12 hr cycle. After 7 days nongerminated seeds were scarified and returned to the growth chamber. At the end of the next 7 days, non-germinated seeds were given a standard TZ test at room temperature to determine viability. Preliminary results indicate that 67% of shallow planted seeds broke dormancy beginning in February, 1997, as opposed to only 14% of the deep planted seeds. Of the remaining dormant seeds, 4% exhibited physical dormancy (germinated after nicking) and 96% exhibited physiological dormancy (did not germinate after nicking). There was no difference between shallow and deep planting in this regard. Seeds were 100% viable at harvest in August, 1996, and have maintained *99.5%* viability through November, 1997.

11:00 THE EFFECT OF HETEROSPECIFIC POLLEN FROM AN INVASIVE SPECIES (*LYTHRUM SALICARIA*) ON SEED SET IN A NATIVE LYTHRUM (*L. ALATUM*) **Beverly J. Brown, Shirley A. Graham, and Randall J. Mitchell, Kent State University, P.O. Box 5190, Kent OH 44242-0001.**

We investigated the potential for *Lythrum salicaria*, an invasive wetland plant, to reduce seed set in *Lythrum alatum* through the presence of heterospecific pollen. *Lythrum alatum*, is one of the most widespread species of *Lythrum* native to the United States and co-occurs with *L. salicaria* throughout most of its range. Three pollen mixtures were applied to stigmas of 776 flowers on 20 *L. alatum* plants over a period of five weeks. Mixtures consisted of 100% legitimate *L. alatum* (legitimate), 50% legitimate *L. alatum*/50% *L. salicaria* (mixed), or 100% *L. salicaria* (heterospecific) pollen. These pollinations resulted in average seed set per plant of 41.8 for legitimate pollen, 31.7 for mixed pollen, and 1.8 for heterospecific pollen. *Lythrum alatum* is a distylous plant, therefore data were also examined for differences in seed set between morphs. In the long morph, average seed set was greater for legitimate and mixed pollen, but the short morph showed greater seed set for heterospecific pollen. These data indicate that presence of *L. salicaria* pollen on *L. alatum* stigmas may inhibit seed set and that the potential for hybrids to form is minimal. However, if hybrids form which carry *L. salicaria*s prodigious ability to spread and *L. alatum*s tolerance for drier habitat, wildlife managers may face even greater reductions in biodiversity as invasive hybrids spread to upland areas.

SESSION 08

Plant Ecology

01:30PM Saturday, April 4, 1998

Johnston Hall 104

Mary Benninger-Truax - Presiding

1:30 EFFECTS OF MICRO-SITE VARIATION ON *LUPINUS PERENNIS* ESTABLISHMENT IN AN OAK SAVANNAH. **Scott D. Kelly, Helen J. Michaels. Department of Biological Sciences, Bowling Green State University, Bowling Green, OH 43403.**

A species' pattern of emergence and survivorship over a season in response to fine scale variation in environmental factors can be used to elucidate the processes that determine offspring recruitment as well as provides insights into landscape level distributions. *Lupinus perennis* L. (Fabaceae), a perennial associated with oak savannah habitats, are commonly found in "open areas" or "canopy gaps" of nitrogen poor, sandy soils. This research links the fine scale requirements of this species to the gap dynamic processes of oak savannahs by asking: 1) What micro-site variables increase successful emergence in *Lupinus perennis*; and 2) What are the optimal conditions for first season establishment and growth? Forty-nine scarified and imbibed seeds were placed into each of 32 experimental grids (0.7 m x 0.7 m), in an oak savannah canopy gap. Half of the grids received a watering treatment. Emergence, survivorship, plant size, soil temperature, soil moisture and ambient light were recorded from May through July, 1997. Establishment and growth varied significantly among grids. Because environmental heterogeneity among grids was substantial, watered and unwatered grids did not differ in seedling emergence and growth. However, regression analysis indicates final seedling size showed significant relationships with several environmental variables. Information from this study will be useful in management of this species and also as a model of micro-site variation as it effects community level processes of an oak savannah.

1:45 THE EFFECTS OF TYPE AND TIMING OF NUTRIENT PERTURBATION ON AN OLD FIELD PLANT COMMUNITY. **Mary Benninger Truax, Jocelyn Muller, Lindsey A. Palmer, and Heather M. McClure, Biology Dept., Hiram College, Hiram OH 44234.**

This study is part of a 5 year examination of the effects of the type and timing of nutrient perturbation regimes on an old field ecosystem. In May, 1995, 16 x 20 m plots were established in a former corn field. Three plots were treated with ammonium nitrate (N) fertilizer in Year 1 only (1995), three were treated with N fertilizer in Year 3 only (1997), and three were treated with N fertilizer each of the three years. Diammonium phosphate (N/P) fertilizer was applied to nine other plots using the same protocol. All perturbed plots received 300 kg/ha nitrogen per year; N/P plots also received 768 kg/ha phosphorus per year. Above ground plant composition and biomass were assessed three times during each growing season for each of the 18 treated plots and 6 control plots. During the first growing season, plant species richness was significantly greater in control plots than nutrient enriched plots, while biomass was significantly greater in N and N/P plots due to the dominance of *Ambrosia artemisiifolia* and *Raphanus raphanistrum*, respectively. Plots treated in Year 1 only recovered quickly from perturbation, resembling the control plot in species composition by Year 2. Plots perturbed in Year 3 had increased biomass production relative to controls, but species composition was similar. *R. raphanistrum* dominated plots treated consecutive years with N/P fertilizer. Although *A. artemisiifolia* was uncommon in any of the plots by Year 3, other annuals (e.g., *Setaria faberii*) dominated plots treated consecutive years with N , , fertilizer. Our results indicate that plant community response and recovery is affected by the type and timing of perturbation and by the age of the system at the time of perturbation. We gratefully thank Dr. Bruce and Janet Johnson and the Howard Hughes Medical Institute for financial support.

2:00 PATTERNS OF GROWTH AND RESOURCE ALLOCATION AMONG PATCHES OF THE CLONAL PLANT *DIPHASIASTRUM DIGITATUM* (LYCOPODIACEAE). **Carrie A. Railing and Brian C. McCarthy, Dept. of Env. & Plant Biology, Ohio University, Athens OH 45701.**

The ecology of clonal lycopods is poorly understood. *Diphasiastrum digitatum* (Dillenius ex A. Braun) Holub. is a rhizomatous lycopod distributed throughout much of Ohio. Hypotheses regarding its distribution, abundance, resource allocation and growth behavior have been largely unexplored. Seventeen clonal patches of *D. digitatum* at Strouds Run State Park in Athens County, Ohio were studied to determine how the above factors responded to ambient differences in light microenvironments and soil moisture, chemistry, and texture. Individual ramets from clones were harvested to determine growth and architectural patterns and to evaluate patterns of biomass allocation. Mean shoot density ranged from 21.6 to 430.4 per m^2; mean percent cover ranged from 5.0 to 82.7 per m^2 and mean reproductive-vegetative ratio ranged from 0.0 to 0.37 for the 17 study patches. Of the environmental and edaphic variables examined, soil moisture was found to best correlate with shoot density, cover and R/V ratio (r_s = 0.74, 0.70, 0.59, respectively; all P (0.01). Soil organic content was negatively correlated with shoot density and R/V Ratio (r_s = -0.51, -0.53; both P (0.05). Results indicate that *D. digitatum* responds to moisture through increased growth and allocates resources to reproduction in richer environments. Light was poorly correlated with the growth and allocation of *D. digitatum*. Subsequent experimental studies will be used to examine cause and effect relationships.

2:15 RESTORATION OF A BARREN COMMUNITY AT THE EDGE OF APPALACHIA PRESERVE. **Marleen Kromer, Dave Minney, and Steve Sutherland, Ohio Field Office, The Nature Conservancy, 6375 Riverside Dr. Ste. 50, Dublin OH 43017.**

In 1996, TNC began restoration efforts on a degraded barren community near Lynx, Ohio, by removing invading woody vegetation. A comparison of pre- and post-treatment vegetation sampling results indicated a significant decrease in percent woody vegetation cover, a significant increase in percent total vegetation cover, a significant increase in the number of herbaceous prairie species per sampling quadrat, and a significant increase in the number of flowering individuals for six prairie species. There was no significant change in the number of prairie grass species per quadrat or the size of the prairie opening. Restoration efforts will continue with a prescribed burn in the spring of 1998.

2:30 THE EFFECTS OF PRESCRIBED FIRE ON UNDERSTORY PLANT COMMUNITIES IN MIXED-OAK FORESTS. **Todd F. Hutchinson, Louis R. Iverson, and Steve Sutherland, USDA Forest Service, Northeastern Forest Experiment Station, Delaware OH 43015.**

Southern Ohio oak forests have been succeeding to more shade-tolerant tree species (e.g., *Acer rubrum, A. saccharum, Nyssa sylvatica*) since fire suppression began in the 1940s. However, the effects of fire suppression, or conversely, the reintroduction of fire, on understory plant communities are largely unknown in these forests. A large-scale prescribed fire study was initiated in 4 study areas (75-109 ha.) in Vinton and Lawrence Counties. Each study area contains a reference (no fire), frequent (annual fires), and infrequent (1 fire every 4 years) treatment unit. Our objectives were to examine the effects of prescribed fire on the richness of understory species and life forms, and on the frequency of individual species. Frequencies of understory vascular plant species were recorded in 108 (25 x 25m) plots in 1995 (pre-burn), and in 1996 and 1997 (post-burn). After two years, average total richness per plot has increased from 65.9 to 70.4 on plots burned once, (paired t test; $p < 0.001$) and from 65.4 to 68.8 on plots burned twice ($p < 0.02$). On both reference and burn plots, forb richness has increased while graminoid and shrub richness have decreased. Tree richness has increased only on burned plots. Although the frequency of most species has not changed significantly following fire, several common species (e.g., *Erichtites hieracifolia, Liriodendron tulipifera, Rubus spp.*, and *Vitis spp.*) have increased in frequency due to abundant seed germination. In general, the effects of fire on understory richness and composition have been subtle but consistent.

2:45 SEED GERMINATION PERCENTAGE IN SMALL AND LARGE POPULATIONS OF WINGSTEM (*ACTINOMERUS ALTERNIFOLIA*) FROM THE RIPARIAN ZONE OF THE KOKOSING RIVER. **Tyler A. Studds, (Dr. E.R. Heithaus); Kenyon College, PO Box 1077, Gambier, OH 43022.**

We undertook this experiment to explore the relationship between population size and four indices of fitness: average seed weight, average number of seeds per flower head, number of flower heads per plant and percentage germination. One leaf per plant was also collected to test for morphological asymmetry within small, potentially inbreeding populations. We hypothesized that individuals from smaller populations will show reduced fitness based on the measured variables. We sampled from two small (< 15 individuals 50-60+ m from the nearest plant) and two large populations (+100) along the Kokosing River. Three flower heads were collected from 60 plants total between all four populations. Seeds from each plant will be germinated in artificial growth chambers under a variety of environmental conditions to determine the breadth each plant's response to a variable environment. We will explore the correlation between germination percentage and population size.

3:00 SEED DYNAMICS OF A STATE ENDANGERED SPECIES ADAPTED TO A DISTURBANCE MEDIATED ENVIRONMENT. **Ross A. McCauley and Irwin A. Ungar, Dept. of Environmental & Plant Biology, Ohio University, Athens OH 45701.**

Froelichia floridana (Nutt.) Moq. var. *campestris* (Small) Fern. (Amaranthaceae), a state listed endangered species restricted to one small site in Washington Co. OH, is being studied to determine the ecological and genetic factors which limit its distribution in Ohio and which may contribute to its conservation. Periodic disturbance is apparently a major factor in the successful establishment and persistence of *F. floridana*, suggesting that a persistent soil seed bank may be critical to its long term survival. A seed budget was determined through the comparison of spring and fall soil cores, germination records, and seed production for the 1997 growing season. This one year seed budget indicates a substantial and stable soil seed bank. On average, 8.2% of buried seed germinate in one year, 17.7% is lost either through death, predation, or relocation to lower soil depths, and 74% remain in a persistent seed bank. Seed production is sufficient to maintain the seed bank at a constant level. One area, however, did show an increase in the seed pool of 5.5%. These findings suggest that this population of *F. floridana* possesses a substantial persistent seed bank which contributes to the survival of this disturbance adapted annual.

3:15 THE ROLE OF PROPAGULE BANKS IN THE RELATIVE RATE OF PLANT SECONDARY SUCCESSION. **Daniel K. Gladish. Department of Botany, Miami University, Oxford OH 45056.**

The rate of secondary succession is influenced by various factors including soil qualities, competitive qualities of the populations present at a given time in the successional series, and the length of time since the original disturbance. It was hypothesized that where two areas share similar environmental conditions but different recent histories leading to a difference in community composition, the resulting difference in propagule banks would cause a difference in the rates of succession following simultaneous severe disturbances. Nearly adjacent 20 x 30 m plots, a maintained turf area and a early-successional woods, were razed in Oct. 1994 and allowed to regrow undisturbed except for annual species surveys. Both areas experienced significant community change the first year, but in subsequent years the "turf area" community showed little dynamics while the "woods area" continued to change rapidly. In Oct. 1997 the turf area was dominated by weedy annual grasses with a few annual forbs. Perennial grasses and woody species were just beginning to appear. The woods area was heavily overgrown with tall annual forbs, annual and perennial vines, shrubs, and tree saplings. In three years time the woods area was significantly ahead in the standard old-field successional series.

3:30 SEED PREDATION BY VERTEBRATE AND INVERTEBRATE SEED PREDATORS IN SECONDARY AND MATURE TROPICAL FOREST. **Evan M. Notman, Dept. of Botany, Miami University, Oxford OH 45056.**

Post dispersal seed predation by animals can have a strong influence on the reproductive success of plants. Invertebrate and vertebrate seed predators may prefer different seed types and differ in their abundances in different habitats thus affecting plant community composition. This study investigated levels of post-dispersal seed predation of 29 Peruvian tropical rain forest tree and liana species in two forest types. Seeds were put in four primary forest and four young (3-5 year old) secondary forest plots. In each plot seeds were placed in three treatments designed to (1) exclude all predators, (2) exclude mammal predators, and (3) allow access by all predators. Seeds were censused biweekly until they died or produced their first leaf. Survival of unprotected seeds was very low (maximum of 32%) for all species. Consumption by rodents was by far the most important source of mortality for all species. Fewer species also experienced significant mortality due to insects. Levels of seed predation were similar in mature and young secondary forest for the majority of species, although survival often varied between plots of the same forest type. These results suggest that for seeds dispersed away from their parent, vertebrates are more important seed predators than invertebrates and can have a very important impact on the recruitment success of a wide variety of species in both young and old forest.

3:45 INBREEDING DEPRESSION IN CHASMOGAMOUS AND CLEISTOGAMOUS FLOWERS OF *VIOLA CANADENSIS*. **Theresa M. Culley, Dept. of Plant Biology, Ohio State University, 1735 Neil Ave., Columbus, OH 43210-1293.**

The evolutionary advantages of producing both chasmogamous (CH) and cleistogamous (CL) flowers is poorly understood in many plant species. CH flowers are large, showy, and may be visited by pollinators, while CL flowers are small, closed, and selfpollinated. Because of mating system differences, the maintenance of CH and CL progeny may be influenced by inbreeding depression (IBD). This study measured the level of IBD by comparing the fitness of selfed CH and CL progeny to out crossed CH progeny in *Viola canadensis*, a white-flowered violet found in beech-maple Lo rests. Hand-pollinations on CH flowers were conducted in the greenhouse in Spring, 1997 and seeds from CL and CH flowers were counted and weighed. No significant differences in the number of seeds per capsule were found among CL and CH treatments. However CL seeds had higher mean seed mass (1.71 mg) than CH selfpollinated seeds (1.56 mg) and CH outcross-pollinated seeds (1.43 mg). All of these differences were significant, indicating that IBD was not apparent at the seed stage. A lack of IBD in V. canadensis may be due to population structure and a deficiency of inter-population gene flow. Research is continuing to determine if inbreeding depression appears in later life cycle stages (germination and seedling survival).

4:00 SEXUAL REPRODUCTION AND SEED SET VARIATION AMONG POPULATIONS OF FEDERALLY ENDANGERED TRIFOLIUM STOLONIFERUM. **Carolee J. Franklin and Allison A. Snow, Dept. of Plant Biology, Ohio State University, 1735 Neil Ave., Columbus OH 43210-1293.**

The quantity and quality of sexual recruitment may significantly impact long-term persistence of rare, clonal species. To explore possible connections between the reproductive ecology of *Trifolium stoloniferum* and the plant's rarity, research was conducted to determine if the species is self-compatible and to evaluate the extent and quality of sexual reproduction in four Ohio populations. Flowers bagged at the bud stage in the greenhouse and the field failed to produce seeds, while openly pollinated (field) and hand-tripped (greenhouse) flowers set seed. *T. stoloniferum* is self-compatible but not autofertile. In 1996 and 1997, senescing inflorescences in populations of varying sizes were collected. The following data were analyzed per inflorescence: number of florets, number of fruits, percent fruit set, seed set, and seed quality. Population measures of mean seed set per inflorescence ranged from 4.1 to 39.0 in 1996 and 7.8 to 68.6 in 1997. In both years, the largest population generated the lowest seed set, and the smallest population set the greatest number of seeds per head. Percent fruit set significantly increased from 1996 to 1997 in three of four populations, and mean seed set similarly increased in two of four populations. Potential reproductive problems for *T. stoloniferum* include low seed set and quality in large populations and dependence on pollinator service to produce seed.

4:15 THE EFFECTS OF DEFOLIATION ON SHOOT TERMINAL MERISTEM GROWTH IN WOODY PLANTS. **David O. Deppong and Morris G. Cline, Dept. of Plant Biology, Ohio State University, Columbus OH 43210.**

Summer (para) dormancy is thought to be responsible for the inhibition of terminal meristem growth and hence the cessation of spring flushing. It has been observed that natural or manual defoliation delays the termination of spring flush and in some cases it causes a second flush after the terminal bud is formed. The purpose of this study was to elucidate the mechanisms of defoliation-induced extension of the spring flush period. To determine this, twigs of mature trees of white ash (*Fraxinus americana var. americana* L., (Autumn Purple)), northern red oak (*Quercus borealis* Michx. f.), green ash (*Fraxinus pennsylvanica var. subintegerrima*, (Vahl.) Fern, (Pat More)), and shagbark hickory (*Carya ovata* (Mill.) K. Koch) were completely defoliated periodically from the beginning of spring flush through the growing season. Spring flush generally started in early May and ended by mid-June. Defoliation caused an increase in shoot growth in all four species but had to be given during flushing to be effective. White and green ash treatments extended the spring flush period and delayed the formation of the terminal bud. Defoliation of red oak and shagbark hickory produced a second flush. Defoliation may promote shoot meristem growth by removal of inhibitors present in leaves or of leaf competition for nutrients and/or water.

4:30 INTROGRESSION BETWEEN TRANSGENIC WILD-CROP HYBRIDS AND WILD *CUCURBITA PEPO*: A TEST OF FITNESS PARAMETERS. **Lawrence J. Spencer & Allison A. Snow, Dept. of Plant Biology, Ohio State University, Columbus, OH 43210.**

Hybridization has been hypothesized to be important for the evolution of plants. For instance, a fitness-related gene may pass from one population to another via hybridization followed by introgression even though F1 and back-cross progeny are less fit than parents. When transgenic crops are grown near weedy relatives, transgenes may move into wild populations by this mechanism, perhaps causing them to become more invasive. To investigate this possibility, we Pollinated wild *Cucurbita pepo* plants with pollen from F hybrids between wild plants and a commercial cultivar genetically engineered for virus resistance. The resultant back-crossed generation (BC_1) was field tested in Arkansas with both parental types (Wild, F_1). A previous field test showed that F_1 hybrids were generally inferior in fitness to wild plants. This study was designed to test the hypothesis that the BC1 generation is intermediate in fitness to the two parental types. Wild and BC_1 plants both showed 94% survivorship while F_1 showed 88%. In both fruit set per plant and male flowers per plant, all cross types were significantly different from one another (ANOVA and Tukey tests), with BC_1 having intermediate numbers of each. These data support the hypothesis that although hybrids between different populations may be inferior to parental types, back-crossing can produce progeny that are closer in fitness to parentals. This study suggests that introgression between transgenic crops and wild populations may produce transgenic progeny with fitness very similar to the wild plants.

4:45 COMPETITION BETWEEN *SALICORNIA EUROPAEA* AND *ATRIPLEX PROSTRATA* ALONG AN EXPERIMENTAL SALINITY GRADIENT. **Todd P. Egan and Irwin A. Ungar, Dept. of Environmental and Plant Biology, Porter Hall 315, Ohio University, Athens OH 45701-2979.**

Salicornia europaea and *Atriplex prostrata* are common inland salt marsh species. *Salicornia europaea* is more salt tolerant than *A. prostrata* and typically grows in the more saline areas of a marsh. This growth chamber experiment was performed to determine the effect of competition on the growth of these two species at varying salinity levels. Plants were grown at a density of eight plants per pot in a de Wit replacement series. Plants were treated with 85, 170, and 340 mM NaCl for two months, and then harvested, dried, and weighed. There was a significant effect of

concentration, competition, and their interaction on biomass production of *S. europaea*. However, only salt concentration significantly affected biomass production of *A. prostrata*. There was a reciprocal relationship between the competitive ability of each species and its salt tolerance. *Salicornia europaea* biomass production was higher at 340 mM NaCl than at 85 mM NaCl in the presence of *A. prostrata*. *Atriplex prostrata* was the better competitor at low salinities, whereas *S. europaea* was the better competitor at high salinities.

SESSION 09

PLANT PHYSIOLOGY

09:00AM SATURDAY, APRIL 4, 1998

JOHNSTON HALL 118

CAROLYN J. MCQUATTIE - PRESIDING

9:00 EFFECT OF ELEVATED MANGANESE ON CELLULAR ANATOMY AND MICRODISTRIBUTION OF ELEMENTS IN SUGAR MAPLE SEEDLINGS. CAROLYN J. MCQUATTIE AND GEORGE A. SCHIER, USDA FOREST SERVICE, 359 MAIN RD., DELAWARE OH 43015.

Manganese (Mn), an essential micronutrient in plants, becomes increasingly soluble as acidity increases and may injure seedlings growing in acidic forest soils. To determine the effect of elevated Mn on sugar maple (*Acer saccharum*), four-week-old seedlings growing in sand were irrigated for 8 weeks with nutrient solution (pH 3.8) containing 0, 5, 10, or 20 mg/L Mn. Foliar symptoms of Mn toxicity ranged from leaf margin necrosis (5 mg/L) to leaf vein chlorosis/necrosis, interveinal chlorosis and leaf puckering (10-20 mg/L Mn). Primary roots exposed to 10 or 20 mg/L Mn displayed darkened root tips and increased loosening of the outer cortex. Root, leaf blade, and midvein tissues from all treatments were chemically-fixed and resin-embedded for transmission electron microscopy; additional tissues were frozen in liquid propane, freeze-substituted in osmium tetroxide and resin-embedded for x-ray microanalysis (EDS). At 10 or 20 mg/L Mn, root meristem cells were irregular in shape, showed increased vacuolation and contained swollen mitochondria with few cristae. Leaf tissues showed dense accumulations in chloroplast thylakoid membranes (10 mg/L), increased starch grain size (10-20 mg/L), and collapsed phloem in midveins (20 mg/L). Although no Mn was detected by EDS in root tissues, peaks of Mn were prominent in xylem and phloem cells of leaf midveins at 10 or 20 mg/L Mn.

9:15 FOLIAR N AND P DYNAMICS OF THREE CHILEAN *NOTHOFAGUS* SPECIES IN RELATION TO LEAF LIFESPAN. K.L.M. DECKER, R.E.J. BOERNER, F. HEVIA HOTT, AND M.L. MINOLETTI O., DEPT. OF PLANT BIOLOGY, OHIO STATE UNIVERSITY, COLUMBUS OH 43210.

Three Chilean *Nothofagus* species which differ in leaf life span and elevational distribution are *N.obliqua* (deciduous) which occurs at lower elevations,and *N.dombeyi* (evergreen),and *N.pumilio* (deciduous)which occur at intermediate and high elevations, respectively. We sampled a single stand at approximately 1500m in which all three species co-occurred. N.dombeyi leaves were heavier, with specific leaf mass approximately twice that of the other species. On a concentration basis, foliar N increased in the order N.dombeyi<*N. pumilio* <*N.obliqua* and foliar P increased in the order *N.dombeyi*<*N.obliqua*<N. *pumilio*. On a leaf area basis, *N.dombeyi* had the highest N and P content. N and P was relatively constant for most of the *N.dombeyi* leaf lifespan, then decreased prior to abscission. *N.dombeyi* resorbed less N than did the two deciduous species. In contrast, *N.pumilio* and N.dombeyi resorbed more P than did *N.obliqua*. These results clarify the relative importance of environmental distribution vs genetically-fixed leaf lifespans in controlling nutrient dynamics of the species.

9:30 LEAD AND ZINC UPTAKE BY *PAULOWNIA TOMENTOSA* SEEDLINGS UNDER ACIDIC SOIL CONDITIONS. GEORGE O. BAKONYI AND (CAROLYN H. KEIFFER), DEPT. OF BOTANY, MIAMI UNIVERSITY, MIDDLETOWN OH 45042.

This study examines *Paulownia tomentosa* to determine the potential for using phytoremediation to reclaim soils contaminated with heavy metals. *P. tomentosa* has been used in recent years to reclaim abandoned strip mines characterized by extremely acidic soil. Under these acidic conditions, heavy metals such as lead, cadmium, aluminum, and zinc become available for plant uptake. In addition to establishing quickly under conditions that are toxic to most other plants, *P. tomentosa* is a valuable timber crop species and it is used to build musical instruments and fine furniture. Although its success at reclaiming strip mines has been documented, its ability to accumulate heavy metals from the soil has not been investigated. The focus of this study was to determine the capability of *P. tomentosa* seedlings to withstand acidic soil conditions, and to determine if this plant is capable of accumulating a significant amount of lead in its shoots. Sixty day-old seedlings were transplanted into Beldon® jumbo 4" pots and were grown for three weeks. Plants were grown in sand and were exposed to three concentrations of Pb and Zn (125, 250, & 500 ppm). Plants were watered daily with a citric acid solution in an attempt to maintain pH levels of 4, 4.5, and 5. A tap water control (pH of 6.9) was also utilized. Plants were harvested and the dry weight biomass, % ash, and the concentration of lead and zinc in roots and shoots was determined. Preliminary results indicate that plant height and biomass were not significantly affected by the various pH and metal treatments. The potential use of this plant for phytoremediation of metal contaminated soils will be determined following tissue analysis.

9:45 TRICHOME CONSTITUENTS OF *CALAMINTHA ASHEI*. GUS E. DRIA (DR. JEFF WEIDENHAMER), DEPT. CHEMISTRY, ASHLAND UNIVERSITY, ASHLAND OH 44805.

The perennial shrub *Calamintha ashei* occurs in the Florida scrub along Florida's Lake Wales ridge. While *Calamintha* is not endangered, many endemic scrub species are threatened by rapid habitat loss due to development. *Calamintha* contains novel, water-soluble menthofuran monoterpenes which inhibit germination and growth of grasses from the neighboring Florida sandhills. This study was undertaken to characterize the trichomes which dot the *Calamintha* leaf surface. It was presumed that these trichomes would contain the previously identified menthofurans. However, GC-MS analyses of trichomes individually removed from leaves show no evidence of the menthofurans, but do show three major constituents which were also detected in headspace by solid phase microextraction. Mass spectra of all three compounds show a molecular ion at 204, suggesting that these may be aromatic derivatives of the menthofurans. An extract of the compounds on the leaf surface, including the trichomes, has been prepared by briefly dipping the leaves in dichloromethane. Isolation and characterization of the trichome constituents is being pursued.

10:00 GRAVITROPISM OF THE INFLORESCENCE STEMS IN STARCH-DEFICIENT MUTANTS OF *ARABIDOPSIS*. S. WEISE AND J. Z. KISS (JOHN Z. KISS), DEPT. OF BOTANY, MIAMI UNIVERSITY, OXFORD OH 45056.

Previous work in this labratory has assayed the gravitropic response of both the roots and hypocotyls of wild type *Arabidopsis thaliana* and three starch deficient strains. The time course of curvature of the inflorescence stems of *Arabidopsis* wild type (strain Wassilewskija) one starchless mutant (ACG 21) and two reduced starch mutants (ACG 20, and ACG 27) were used to assay gravitropism. The plants were grown in rockwool cubes, a porous silica based substrate. The plants were then reoriented in the dark by rotating the rockwool cube 90 degrees so the inflorescence stems were aproximately perpendicular to the gravity vector. The plants were photographed initially after reorientation and then at regular intervals for 8 hours. The short inflorescence stems (1-2.9cm) were less responsive then the long stems (3-6cm) to the gravistimulus. In both data sets the wild type initally had the greatest response and the starchless mutant had the least response while the reduced starch mutants exhibited an intermediate response. Growth rates for all four strains were approximately equal. Approximately 8 hours after reorientation all of the strains returned to a position parallel to the gravity vector. It appears that statoliths play an important initial role in gravitropism, accelerating the response of the inflorescence stem. However, after longer time intervals, the three mutant strains had a full gravitropic response similar to that of the wild type, which indicates that in flower-stalks, longer term gravitropism is independent of the total mass of the statoliths.

10:15 CHEMICAL REPELLENCY OF MINTS (*MENTHA* SPP.) AND THEIR EFFECTS ON PLANT PERFORMANCE AND INSECT ABUNDANCE AMONG COLLARD GREENS. ONESIMUS L. OTIENO, KELLY JOHNSON, AND JAN SALICK, ENVIRONMENTAL AND PLANT BIOLOGY DEPT. OHIO UNIVERSITY, ATHENS OH 45701.

Intercropping food plants has often been associated with reduced pest damage. This method has been widely used in Integrated Pest Management (IPM). The nature of intercrop relationships is variable and several theories which model plant-plant and insect-plant interactions have been developed. This study sought to determine if mints affect insect abundance or plant performance and if so, by what mechanism such effects are achieved. First, Collard greens (*Brassica oleracea* var. acephala) were intercropped with three species of mints (*Mentha arvensis*, *M. piperita* and *M. spicata*) as well as a 'neutral plant' (*Verbena urticifolia*). Second, mint extracts were sprayed on monocrops. Collard performance was assessed by biomass, leaf petiole diameter, and percent leaf area removed by insect herbivory. Insect abundance was monitored using sticky cards and vacuum suction samples. Results indicate that mints have significant effects on both plant performance and insect abundance. These were mediated by chemical means and *M. spicata* was less effective at suppressing insect abundance and enhancing collard performance. Physical intercrops were more effective than the extract sprays. The presence of mints enhanced collard performance and generally suppressed arthropod abundance among the eleven insect taxa observed.

10:30 EFFECT OF THE CONCENTRATION OF HYDROGEN PEROXIDE ON THE SENSITIVITY OF TEXAS MALE STERILE CYTOPLASM MAIZE LEAVES TO T-TOXIN PRODUCED BY *BIPOLARIS MAYDIS* RACE T. JD BELTRAN & MO GARRAWAY, DEPT. PLANT PATHOLOGY, OHIO STATE UNIVERSITY, COLUMBUS OH 43210.

Leaf strips (12 cm x 1.5 cm) from Texas male sterile (Tms) cytoplasm maize cultivars B37, OH43 and W64, were infiltrated with 0.1µg/ml of T-toxin from *Bipolaris maydis* race T for 24 h in the dark at 28 C. They were cut into 4 cm segments, immersed in 25 ml DW containing 0, 2, 4, 24 or 96 µMoles of H_2O_2, then incubated for another 24 or 48 h in the dark at 28°C. The effect of H_2O_2 on the sensitivity of the leaf segments to T-toxin was determined by comparing the conductivity (µmhos/mg dry wt./24 h) of the immersion solutions after these two incubation times. Leaf segments had increased sensitivity to T-toxin when they were immersed in DW containing 2 or 4 µMoles of H_2O_2. In contrast leaf segments were less sensitive to T-toxin when immersed in solutions containing 24 or 96 µMoles of H_2O_2. The reduced sensitivity of leaf segments to toxin seen at the higher concentrations of H_2O_2 was reversed when the immersion solutions also contained 8 x 10^{-4} µg/ml of catalase. These observations could be taken to mean that alterations in H_2O_2 levels might be involved in the altered sensitivity of Tms cytoplasm maize leaves observed previously in response to temperature, light and dicarboxylic acids.

10:45 DETERMINATION OF ANTI-YEAST HEXOKINASE ANTIBODY SPECIFICITY IN TOBACCO PLANTS. Tracy L. Deem (Steven R. Spilatro), Dept. of Biology, Marietta College, Marietta OH 45750-4016.

In a variety of higher plants that have been studied, sugars play a regulatory role in photosynthetic gene repression. Until recently, no mechanism has been identified that would explain how sugar signals are transmitted to the nucleus. Some studies have indicated that hexokinase is a key sensor for detecting and transmitting sugar signals. To better understand this sugar sensing pathway, rabbit antibodies against commercial yeast hexokinase will be used to measure hexokinase levels in tobacco tissue cultures grown in the presence of different levels of sugars. Initially, the ability of the antibodies to recognize plant hexokinase will be determined. Research to date has shown that the yeast hexokinase required purification before antibodies could be raised. Purification has been accomplished using Mono-Q and Superose-12 columns attached to a FPLC.

SESSION 10

Wetland Ecology

09:00AM Saturday, April 4, 1998

Johnston Hall 104

David A. Francko - Presiding

9:00 SPATIAL HETEROGENEITY OF BACTERIA IN A NEWLY REHABILITATED WETLAND. G. Darrel Jenerette, Dale A. Casamatta, Alexander B. Collier, and Pamela L. Brutsche, Dept. of Biological Sciences, Kent State University, Kent OH 44242

Wetlands are considered important natural resources. Their ability to filter and clarify water makes them important bioregulators for aquatic systems. As their value becomes more evident, however, they are under increasing stress from development, pollutants, and urbanization. For successful wetland rehabilitation, the biological processes must be understood. Much is known about the macrophytic flora and associated fauna of wetlands. However, little is known about the characteristics of the bacterial community. We examined the change in bacteria along two _10 meter transects with a 38cm and 14cm change in standing water depth. To characterize changes in the bacterial community we examined the gram character, shape, and ability to utilize site specific leachate for growth. Along each 10 meter transect, 4 sample sites were selected: open standing water; adjacent to a cattail stand (*Typha sp.*); and two in a mixed *Phragmites australis* and *Juncus effusus*. bed (14 cm water). From each site, 30 bacterial strains were isolated from 1-3 cms. above the sediment and grown on Standard Methods Agar (SMA). Leachate utilization was tested by plating the isolates from each site on leachate from all 8 sites (individually) and comparing growth as colony forming units. These tests suggest that the bacterial community was partitioned into distinct functional communities based on the ability to use localized leachate. Some differences were found in the proportion of gram character and shape. These findings have implications for wetland ecology and spatial trends in environmental microbiology.

9:15 POSSIBLE EVIDENCE FOR SELECTION OF ENVIRONMENTAL BACTERIA BY THE CYANOBACTERIUM *MICROCYSTIS AERUGINOSA*. Dale A. Casamatta and C.E. Wickstrom, Dept. of Biological Sciences and Water Resources Research Institute, Kent State University, Kent OH 44242-0001.

Algae are an integral component of most lentic systems and may be either prokaryotic or eukaryotic. Cyanobacteria, also known as the blue-green algae, are prokaryotes but are functionally very similar to their eukaryotic descendants: both are primary producers and both serve as the base of the food web in most aquatic systems. Many algae release compounds during cell metabolism and photosynthesis which may stimulate the surrounding bacterial community by providing organic substrates or growth factors. Conversely, some products may inhibit or kill sensitive bacteria of the surrounding community. *Microcystis aeruginosa* is a freshwater cyanobacterium intimately associated with environmental bacteria , possessing large numbers attached to and/or within its mucilaginous colony. *Microcystis* may form extensive blooms and be responsible for taste, odor, and aesthetic problems in lentic systems around the world. Some strains of *Microcystis* release microcystins which are toxic to animals. The effects of *Microcystis* on prokaryotes, however, are not known. This study was undertaken to determine if *Microcystis* exerts a selective pressure within its domain upon naturally co-occurring bacteria to a greater extent than those not co-occurring, as represented by isolates from a local *Microcystis*-free lake. 50 bacterial isolates from each habitat were grown on Stand Methods Agar (SMA) and used in the experiments. Antibiotic effects of whole cells, homgenized cells, and *Microcystis* exudate showed significant differences between isolation habitats. The growth rates and chemotaxic responses of the two communities to *Microcystis* exudate also differed, showing greater stimulation and chemotaxic attraction among co-occuring bacteria than those from the *Microcystis*-free site.

9:30 DIVERSITY OF FRESHWATER DINOFLAGELLATES IN OHIO. Susan Carty and Victor Warren Fazio III, Dept. of Biology, Heidelberg College, Tiffin OH 44883.

Little is documented about the diversity of freshwater dinoflagellates within a state or region of the country. Here we report the first multi-season survey in Ohio. Habitats sampled included reservoirs, small ponds, and ditches during four summer seasons, from 1992-1997. Five hundred samples from 67 Ohio counties have yielded 49 taxa of freshwater dinoflagellate in 18 genera including 40 photosynthetic taxa and nine heterotrophic species. Sixteen species are naked and the remainder thecate. Species found that are rarely reported include *Katodinium spirodinioides, K. fungiforme, Thompsodinium intermedium, Peridinium goslaviense, Peridiniopsis elpatiewski, P. thompsonii, P. berolinense, P. cunningtonii, Woloszynskia reticulata,* and *Sphaerodinium fimbriatum*. We have indications of seasonality in some species, habitat preference by some, and lack of preference by many.

9:45 ALGAL VERSUS AQUATIC MACROPHYTE PRIMARY PRODUCTION AT THE OLD WOMAN CREEK NATIONAL ESTUARINE RESEARCH RESERVE, HURON, OH. Tara E. Martz, and David A. Francko, Botany Dept., Miami University, Oxford OH 45056.

The Old Woman Creek National Estuarine Reserve, located in Erie county, Ohio at the edge of the Western Basin and the southern-most point on the Great Lakes, represents the only freshwater reserve in the NERRS program. Coastal managers and ecologists are both interested in developing a field-based management model that may be implemented by workers in the field and applied to various wetland settings. Knowledge of photosynthetic carbon flow rates are requisite for such modeling, since the products of photosynthesis determine the structure and function of higher tropic levels. Primary production measurements were conducted from June to October, 1997. The ^{14}C-bottle incubation method was used to measure *Nelumbo lutea* floating leaves, *Potamageton pectinatus*, epiphytes, and algal productivity. Water chemistry, solar illumination, percent cover, and water depth data allowed for the conversion of short-term rates into whole estuary values for individual dates and for the growing season. An estimation of annual production rates was determined from the growing season photosynthetic carbon budget. This allows the testing of the hypothesis that macrophytes and their attached epiflora and not phytoplankton, as previously believed, are the preeminent primary producer component in OWC.

10:00 DYNAMICS OF INVASIVE MACROPHYTE SPECIES IN THE OLD WOMAN CREEK WETLAND, HURON, OH. David A. Francko and Robert S. Whyte, Dept. of Botany, Miami University, Oxford OH 45056.

Coastal wetlands of the lower Laurentian Great Lakes of North America remain poorly characterized. In a multi-year study (1992- present) based in the Old Woman Creek National Estuarine Research Reserve (OWC), a barrier-beach, drowned river mouth wetland located on Lake Erie near Huron, OH, we have conducted a floristic analysis and examined biotic and abiotic factors that drive plant community dynamics. As part of this study, we monitored the pioneer colonization phase of two invasive aquatic macrophyte species, *Phragmites australis* (giant reed) and *Myriophyllum spicatum* (Eurasian water milfoil) which had recently appeared in the wetland. *Phragmites* has largely displaced preexisting members of the emergent macrophyte community (e.g., cattail). Although conditions should favor milfoil colonization, this species has not yet become established in OWC. Preliminary data suggest that native vegetation could be reintroduced to *Phragmites* stands and that a combination of winter drawdown and perhaps allelopathic agents released by the dominant macrophyte American lotus prevent widespread milfoil colonization. Collectively, these data may have implications in constructing field-based management models for Ohio's Lake Erie coastal wetlands.

10:15 AMERICAN LOTUS AS AN ECOLOGICAL KEYSTONE SPECIES IN THE OLD WOMAN CREEK WETLAND, HURON, OH. Cynthia Merrill, David A. Francko and Robert S. Whyte, Dept. of Botany, Miami University, Oxford OH 45056.

In a multi-year study (1992-present) based in the Old Woman Creek National Estuarine Research Reserve (OWC), a barrier-beach, drowned river mouth wetland located on Lake Erie near Huron, OH, we have conducted a floristic analysis and have examined biotic and abiotic factors that drive plant community dynamics. The macrophyte community in OWC is dominated by dense beds of the floating leaved species *Nelumbo lutea* (American lotus), which covers 30-40% of the estuary surface. During midsummer 1997 we measured key limnological variables in transects from open water through lotus beds. Data were used to test the notion that lotus plants represent an ecological keystone species in OWC, thus altering physico-chemical conditions for other macrophyte and algal species. Water pH values consistently were higher (ca. 0.2 units) in open waters surrounding lotus beds versus within beds. Conductivity varied less than 5% in open waters versus beds. The pH gradient generated by *Nelumbo* beds appeared to be related to plant density. The data collectively offer conditional support for the keystone species concept in OWC.

10:30 VEGETATION DYNAMICS OF LAKE ERIE COASTAL WETLANDS. Sandra Cesarov, Robert S. Whyte, and David A. Francko, Dept. of Botany, Miami University, Oxford OH 45056.

Currently there is little data characterizing the coastal wetlands of Lake Erie. Old Woman Creek National Estuarine Research Reserve (OWC-NERRS), a barrier-beach, drowned river mouth wetland located on the western basin of Lake Erie in Huron, Ohio is the only freshwater reserve in the NERRS program, and thus it has been the focus of numerous wetland studies. Preliminary data suggests that the community dynamic variables of OWC are statistically similar to several other Lake Erie barrier-beach, diked, and coastal lagoon wetlands. Wetlands surveyed include Dupont Marsh, Pickerel Creek, Sheldon's Marsh, and Arcola Creek. All systems appear to be disturbed and have low species diversity. All systems tend to be dominated by just a few species, although not necessarily the same species in each system. Invasive *Phragmites australis* (giant reed) tends to dominate in highly disturbed systems. Criteria for comparisons of coastal wetlands of the eastern and western banks of Lake Erie are based on quantitative vegetation analyses, examination of biotic and abiotic factors driving plant community dynamics, and comparing the data to literature. A simple model compares and contrasts coastal wetland systems to determine the ecological plausibility of OWC as a management-based modeling system for Lake Erie.

EARTH & SPACE SCIENCES DIVISION

SESSION 11

GEOGRAPHY

09:15AM SATURDAY, APRIL 4, 1998

JOHNSTON HALL 111

JEFFREY J. GORDON - PRESIDING

9:15 UNDERGRADUATE GEOGRAPHY INSTRUCTIONAL TECHNIQUES: AN ASSESSMENT. JEFFREY J. GORDON, DEPT. OF GEOGRAPHY, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN, OH 43403.

This research arose from the Department of Geography at BGSU rededicating itself to high quality undergraduate instruction as its chief strength and major emphasis. The study focused specifically on how geography is taught to undergraduate students across the U.S. It sought to find the most effective pedagogical techniques demonstrated to transmit critical understandings to students, thereby allowing the BGSU geography faculty to maximize the effectiveness of the student learning environment and, thus, the learning outcomes. Use of identified superior teaching perspectives and methods should best prepare students with those geographical skills necessary for the marketplace or graduate school. The professional geographic literature and returned questionnaires received from schools teaching undergraduate geography revealed current trends in geographic pedagogy. Some successful techniques found have long been around, although not currently widely used, such as oral presentations, poster exercises, oral history, geography clubs, and fieldwork. Other successful techniques found are relatively recent innovations; these include interactive lectures, topic synthesis, structured discussion, group learning, writing groups, tutorial groups, role playing, service learning, computer and emerging technologies.

9:30 EXTREME AND PERCENTILE ENVIRONMENTAL REFERENCE TABLES (EXPERT). PATRICK M. HAYES, 88TH WEATHER SQUADRON, 2049 MONAHAN WAY, BLDG 91, WRIGHT-PATTERSON AFB OH 45433-7204

The Extreme and Percentile Environmental Reference Tables (ExPERT) program is designed to provide the scientist, student, educator, engineer, environmental modeler and meteorologist with a common language for discussing the exposure to, and impact of, climatic conditions on the subject of concern. To accomplish that goal, ExPERT uses new statistical analyses of climate data to provide a more realistic picture of the weather environment. ExPERT uses a detailed database for worldwide characterizations of all major land areas, ocean surfaces, and atmospheres up to 80,000 feet. Developed jointly by the 88th Weather Squadron, Air Force Research Laboratory, and the Air Force Combat Climatology Center, ExPERT contains data for nine different climatic regimes, six upper-air regions, four ocean regions, and 360 individual sites worldwide. For land regions and individual sites, durations and monthly percentiles are included for commonly observed weather elements (temperature, dew point, humidities, wind speeds, cloud cover, and weather occurrences) as well as correlations of relative humidity to temperature and diurnal temperature to daily low temperatures. Over water, monthly percentiles for pressure, temperature, dew point, sea surface temperature, and wind speed are reported. For upper-air regions, summer and winter percentiles are included for temperature, dew point, density, and wind speed at 25 levels from the surface to 80,000 feet. ExPERT is an easy-to-use, point-and-click, graphical, CD-ROM-based program that runs under Microsoft Windows. ExPERT is available to any requestor and is free of charge.

9:45 GIS: SITING ROOFTOP PHOTOVOLTAICS. AARON R. GECKLE (DR. KARL KORFMACHER), DENISON UNIVERSITY, SLAYTER BOX 678, GRANVILLE OH 43023.

As higher levels of air pollution and the depletion of fossil fuels from the production of electricity have become apparent, it is increasingly evident that the need for alternative forms of generating electricity will be necessary in the very near future. The combustion of coal and other fossil fuels for the production of electricity must be curbed to reduce major air pollutants as mandated by government and prevent the exhaustion of natural resources. With the need to find alternative forms of electricity production well established, it is necessary to determine the most promising technologies for widespread implementation. Photovoltaics systems located on rooftops are an effective means of generating electricity to be used on site. When installed correctly, the total or peak time electricity needs of the building can be adequately met. Finding the optimal site for installation of photovoltaics has often been a difficult process. Applying Geographic Information Systems (GIS) to the process of siting rooftop photovoltaics can make it substantially easier to find optimal areas. This project intends to combine the knowledge of photovoltaics and GIS applications to show the benefits and limitations of using GIS to site rooftop photovoltaic systems. The use of county Digital Orthophoto Quadrangles (DOQ's) from the USGS and solar radiation data from the National Renewable Energy Laboratory allow for the calculation of rooftop areas and, ultimately, an excellent estimate of the overall photovoltaic power potential of various sites.

10:00 BREAK

10:15 MAPPING COUNTY WITH SATELLITE IMAGRY: AN EXPERIMENT WITH DATA FROM SANDUSKY COUNTY, OHIO. YU ZHOU, DEPARTMENT OF GEOGRAPHY, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN OH 43403.

A county map is an important tool in applications such as natural resource management, urban planning, environmental education, or even everyday use. The traditional county map in the state of Ohio is normally a pure cartographic product with emphasis on transportation and townships. Maintaining and updating such a map, with either conventional cartographic method or more updated computer methods, is usually expensive and time consuming. The use of recent, high spatial resolution satellite remote sensing, however, can provide an alternative for the traditional county map production process. Combining transportation-oriented map features with a high resolution satellite image can not only speed the mapping process, but also increase the usefulness of this type of map. The satellite image can add details such as land use and large buildings onto the map to give map readers an extra dimension to understand the map. In this experiment, a Sandusky County map is generated by using U.S. Census Bureau TIGER files and IRS (Indian Remote Sensing) 5-meter resolution panchromatic image. The experiment demonstrates that using satellite image can provide a standard to create and/or update a county map in a very economic way.

10:30 ECOSYSTEMS UNDER ASSAULT: THE CASE OF THE MAQUILADORA BORDER CITIES. CHRISTOPHER CUSACK* AND WILLIAM G. CUSACK**, **DEPARTMENT OF LATIN AMERICAN STUDIES, SAN DIEGO STATE UNIVERSITY, *DEPARTMENT OF GEOGRAPHY AND PLANNING, UNIVERSITY OF AKRON, AKRON, OH 44325-5005.

Rapid growth of the 'maquiladora' border cities between the United States and Mexico is creating severe environmental degradation in and around these urban areas. The disruption of natural ecosystems by a proliferation of population and industry is necessitating land use and conservation programs and policies. The principal cause of the rapid growth of these cities is foreign investment. Movement by transnational corporations and construction of new manufacturing plants in maquiladora towns has resulted in economic prosperity and environmental degradation. A case study of the border cities of Tijuana, Mexico and San Diego, California reveals the correlation between increased industrial pollution and reduced ecological diversity. Special attention is given to the Tijuana National Estaurine Reserve, an important salt water marsh ecosystem home to many rare and endangered plant and animal species. A review of current and future conservation policies indicates that joint efforts between San Diego and Tijuana will likely result in long term success for ecological preservation.

SESSION 12

GEOLOGY

09:00AM SATURDAY, APRIL 4, 1998

JOHNSTON HALL 015

ANN F.H. GRAETSCH HARRIS - PRESIDING

9:00 LOOKING AT THOSE OHIO ROCKS: TEACHING THAT OHIO IS NOT THE WAY IT USED TO BE. JOSEPH T. HANNIBAL, THE CLEVELAND MUSEUM OF NATURAL HISTORY, 1 WADE OVAL DR., CLEVELAND OH 44106.

It is a common misconception that the landscape of Ohio, and the configuration of Lake Erie, have always been the way that they are seen today. The Cleveland Museum of Natural History has attempted to correct this misconception in an exhibit pod called "Ohio Rocks" as part of its new Reinberger Hall of Earth & Planetary Exploration. This exhibit pod includes core material on loan from the Ohio Division of Geological Survey, a faux rock wall, touchable fossils and rocks, and an interactive station that allows visitors to discover just how different Ohio was in the geologic past. The initial screen of the interactive station includes a depiction of a core and a geologic map of Ohio. Visitors are prompted to explore Ohio's past by selecting a segment of geologic time and an accompanying "rock video." When a selection is made, the relevant rock layers are highlighted on the map and a "rock video" begins. The videos include clips of rock outcrops, reconstructions of paleoenvironments, and lighthearted studio and field shots. The chorus of each song repeats the basic message that Ohio is not the way it used to be. Each individual song tells about part of Ohio's geologic history. Each song is done in a different style and has catchy lyrics. The Silurian selection, for instance, is called "Silurian surf," and is meant to teach that there was a sea here in the Silurian. The interactive site was developed with Impact Communications and was supported by a National Science Foundation grant.

9:15 LAWS OF THE GEOSPHERE. GARRY MCKENZIE, GEOLOGICAL SCIENCES, OHIO STATE UNIVERSITY, COLUMBUS OH 43210.

What are the laws that control the operation of the geosphere? A unifying theory that would explain everything has eluded us; however, with the rebirth of Earth system science, geologists have formulated or restated important concepts (from Thornbury's fundamental concepts of geomorphology to Keller's fundamental concepts of environmental science). In the 1970s Commoner gave us the "Laws" of Ecology and in the 1990s Bartlett stated the requirements for sustainability. In the same vein for several years I have been assembling and discovering the Principles of the Geosphere — important concepts and understandings for humans on spaceship Earth. These and other "laws" must be considered in any attempt to join the Physical/Chemical/

Biological Process (Bretherton) Diagram to the Social Process Diagram to generate a Comprehensive Earth System Diagram or to design the "Operating Manual for Spaceship Earth". Defining, clarifying and discussing such laws also provides a classroom activity in Earth system science. Six of the current "laws" are: 1) Everything is connected to everything else (Commoner), 7) Fresh water, energy, and phosphate are limiting geologic resources, 8) Natural disaster losses increase with population density, 10) Misery is the ultimate check on population (Boulding), 12) Synergy and thresholds surprise us, and 15) Asteroid impact and plague disrupt long-range planning; a red giant ends it. The "laws" evolve with our understanding of the Earth system; expect additions, deletions, and restatements.

9:30 SILURIAN DIMENSION STONE—ITS HISTORICAL USE IN WEST CENTRAL OHIO. **Mark J. Camp, Dept. of Geology, University of Toledo, Toledo, OH 43606.**

The bedrock of west central Ohio includes a number of Silurian units that were quarried, mainly in the eighteenth and early nineteenth centuries, for use in foundations, bridge abutments, canal locks, curbs, and huildings. The Dayton Formation which rarely exceeds five feet in thickness was most widely quarried within its namesake city, but because of the shallowness of the pits, quarrying sites are hard to locate. Structures built of this stone are scattered through the city, but undoubtedly the best place to observe them is in the older part of Centerville and Washington Township where over 30 stone buildings and a water-filled quarry remain. A famous site is the water-filled McDonald quarry, south of Xenia, which supplied Ohio's contribution to the construction of the Washington Monument in 1850—a block of Dayton Formation. An older Silurian unit, the Brassfield Formation, saw local use as a building stone. It was quarried at Centerville, deeper quarries in the Dayton vicinity, Eaton, and Piqua. Older buildings in Dayton's Veterans Administration complex and canal locks near Piqua exhibit this stone. Younger units including the Euphemia, Springfield, and Cedarville dolomites, quarried at a number of sites in Clark and Greene counties and at Covington, Greenville, Lewisburg, and Ludlow Falls, also saw local use as building material. Lewisburg was a major stone center around 1900, with over six quarries in operation. Building stone was the major product in the early years, but it was gradually replaced by lime for plaster, mortar, steel flux, and sugar refining and crushed stone. In the 1940s, one of the Lewisburg quarries initiated the first underground limestone mining in this part of the state by tunneling into the quarry walls. Few of these sites are worked today and none regularly produce dimension stone, but the legacy lives on in the historic stone architecture of west central Ohio.

9:45 COAL MINE DISASTERS IN THE BROOKFIELD MINE, TRUMBULL COUNTY, OHIO. **Ann G. Harris, Dept. of Geology, Youngstown State University, One University Plaza, Youngstown OH 44555.**

More than one hundred years ago the Mahoning Valley in northeastern Ohio had a thriving coal mining industry, a fact that most residents of today are not aware of. Because coal mining is a dangerous industry it is not surprising that there were major mining disasters in the Mahoning Valley. Most of the Brookfield Mine located in Trumbull County became flooded on July 21, 1865 after a severe rain storm. Only the very highest workings were above water level. Four miners were trapped in two separate locations in the mine. Two were rescued after seven days and the other two after nine days. A second disaster occurred on July 11, 1877. A new tunnel had been installed in the mine to shorten the hauling distance to the chutes on the surface. The horses used for hauling were replaced with a mine locomotive that burned coal. Provisions were made to prevent smoke and gasses from entering the mine, but none were made for the actual tunnel. Because of earlier problems with the gasses and smoke, anthracite coal was substituted for the bituminous coal, on July 11th, since it was supposed to burn without smoke. It, however, filled the tunnel with CO_2 because of incomplete combustion and the miners began dropping. Rescuers from other mines were also overcome. A total of seven miners were killed.

10:00 BREAK

10:15 THE SALUDA FORMATION OF OHIO. **Gregory A. Schumacher, Ohio Division of Geological Survey, 4383 Fountain Square Dr., Columbus OH 43224.**

The Saluda Formation is unique in the Upper Ordovician, Cincinnatian Series of Indiana and Kentucky because its sparsely fossiliferous, fine-grained to microcrystalline, generally thick- to massive- bedded dolomites and dolomitic limestones contrast sharply with the diagnostic highly fossiliferous, coarser grained, thinner bedded limestones and shales that characterize the series. The Saluda is a lenticular body of rock having its northern pinch-out in east-central Indiana and west-central Ohio. In Ohio, this investigation is the first to use regional field mapping, measured sections, and continuous core descriptions to delineate the Saluda's areal distribution and lithostratigraphic relationships. Sparsely fossiliferous, nodular, micritic limestone interbedded with shale characterize this unit in Ohio. The Saluda thins northeastward from 3.4 meters 2 kilometers west-northwest of Reily, Ohio near the Indiana-Ohio border to less than 60 centimeters in the vicinity of West Elkton, Ohio in southeastern Preble County. Overlying the Saluda is a persistent sequence of thick- to medium-bedded, planar to irregular limestones containing occasional large coral and stromatoporoid colonies. Underlying the Saluda sequence is a highly variable interval of intertonguing lithologies of the Whitewater and Liberty Formations having rare coral and stromatoporoid colonies. The Saluda Formation is recognized by the Ohio Division of Geological Survey as a formal lithostratigraphic unit in west-central Ohio.

10:30 A GEOCHEMICAL INVESTIGATION OF THE EXTENT OF DISPERSION OF ORE ELEMENTS ASSOCIATED WITH A ZINC-IRON MANGANESE DEPOSIT IN OGDENSBURG, NEW JERSEY. **Patricia F. Buis, Mining Engineering Dept, University of Alaska-Fairbanks, Fairbanks AK 99775-5800 and Kenneth A. LaSota, Dept of Natural Sciences, Robert Morris College, Pittsburgh PA 15219-3099.**

The Sterling Hill ore deposit of Ogdensburg, New Jersey is a zinc-iron-manganese body contained within the Franklin Marble Formation. In an attempt to determine the extent of the deposit, a series of exploratory drill holes were made extending out from the ore into the surrounding country rock at different elevations. Samples from ten of these drill holes were analyzed for ore element concentration through atomic absorption. Since calcite was the primary mineral of the country rock, x-ray diffraction analysis was also performed on the samples to determine the degree the calcite had incorporated these elements into its crystal lattice. Results of the analysis indicated that each of the ore elements had migrated out from the ore body into the country rock different distances for any given drill core. Also, for any two different drill cores, a given ore element did not appear to have migrated out of the ore body to the same distance. The geometry of ore element dispersion for this ore may serve as a guide for further ore exploration of similar deposits.

10:45 PLANETS EARTH AND MARS: ANALYSIS OF THE EFFECT OF NATURAL SATELLITES ON THE ORIGIN AND EVOLUTION OF LIFE FORMS. **Robert J. Malcuit, Dept. of Geology & Geography, Denison University, Granville, OH 43023.**

Planet Earth has the only known extant biological system in the Solar System. Most concerned scientists agree that this highly developed system is the result of liquid water on the surface, an oxygenated atmosphere, an ozone layer in the atmosphere, and a greenhouse effect that keeps the surface temperature within certain limits. Planet Mars had a few of the features listed above in its early history. It had liquid water at the surface and a significant greenhouse effect from a combination of carbon dioxide from volcanic degassing of the planetary interior and water vapor in dynamic equilibrium with surface water. Planet Earth has developed, over geologic time, a very complex biological system. Mars, in contrast, may have developed a short- lived, very primitive biological system. Earth has a very large satellite (about 1/81 the mass of the planet); Mars has two very small natural satellites about 1/20,000 of the mass of the planet). The question is: Would a large (about 1/50 Mars-mass) satellite have led to more favorable conditions for the development of a life system on Mars? One physically possible process for acquiring a large satellite is gravitational capture. During the capture encounter (with a 1/50 Mars-mass planetoid) about 8 km rock tides are raised on the planet and even higher ones on the encountering planetoid. As the early post-capture Mars-centered orbit gradually circularizes, the tidal amplitudes systematically decrease. Such rock tide action would cause (1) partial destruction of the Martian crust and (2) substantial hydrothermal activity in the newly formed, water-filled basins. These conditions would be much more conducive to the origin and development of life forms than the standard model for the evolution of Mars.

SESSION 13

Geology: Till Revisited and Other Geology

01:30PM Saturday, April 4, 1998

Johnston Hall 015

Julie Weatherington-Rice - Presiding

1:30 Divisional Business meeting

2:00 TEST PIT CONSTRUCTION FOR SITE INVESTIGATIONS: SMALL AND LARGE SCALE. **Ann D. Christy and Duane Carey, Ohio State University, Dept. of Food, Agricultural and Biological Engineering, 590 Woody Hayes Drive, Columbus OH 43210-1057.**

Joints and fractures are common in Ohio glacial tills. These features can extend from ground surface through soils and into the lower geologic strata. Jointing is caused by regional glaciotectonic stress, local desiccation, and thermal expansion/contraction. The resultant fractures often control shallow ground water flow paths and rates. Therefore, a thorough site investigation in till environments should include an evaluation of the presence, extent, and density of subsurface fractures. The test pit is one approach to directly assessing fracturing. Two 12-foot deep test pits were designed and constructed to enable site investigators to identify and map subsurface joints and fractures in three dimensions. The smaller pit, located in Clark County near Tremont City, covered an area of 12 feet by 20 feet. The larger scale pit, located in Madison County near London, covered an area of 33 feet by 84 feet. Both pits were designed with multiple 3-foot benches which allowed fractures and joints to be traced while meeting excavation safety requirements. Field modification during construction included removing smeared materials using hand tools and careful archeological techniques, using a portable pump for drainage, and covering pit surfaces with plastic to prevent desiccation.

2:15 CHARACTER OF JOINTS IN DARBY TILL NEAR LONDON, OHIO. **C. Scott Brockman, Ohio Geological Survey, 4383 Fountain Sq.Dr., Columbus OH 43224.**

Joints or fractures in silt loam Darby Till were observed during late August 1997 in a large, benched soil pit on the Darby Plain. The pit was dug to characterize joints in a typical glacial setting in central Ohio. Pit design and ground-water movement in the till are described in other abstracts in this session. The pit was prepared in Lewisburg soil, a silt loam that has a shallow solum on a moderately well drained, low-relief swell mapped as one of the northern crests of the London Moraine. Unoxidized till was fairly uniform, having no low-angle shears or imbricated clasts

indicative of lodgement till; it was probably deposited as surface melt-out till during the Late Wisconsinan, about 17,000 years ago. Near the surface, joints formed near-vertical ped prism boundaries. Fewer joints were encountered as depth increased. On a planar bench in the pit at 1.06 m, joints formed 4- to 7-sided irregular polygons; their largest diagonals ranged from 0.7 to 1.0 m. At the 1.86-m bench, there were fewer polygons/area and diagonals ranged from 1.0 to 2.0 m. During the four days the pit was observed, spacing between the two vertical faces of the joints widened from < 0.25 to about 0.5 mm. The joint faces were irregular planes having a relief of about 2 to 7 mm over an area of 1 sq cm at a depth of 1.5m, providing a moderately rough path for groundwater flow. A zone of white secondary carbonate precipitate about 1 to 6 mm thick coated joint faces as well as co-mingled with the adjacent till. Characteristics of joints at this site appear to match those at other sites of Late Wisconsinan age in Ohio.

2:30 PHYSICAL, CHEMICAL AND MINERALOGICAL PROPERTIES OF THE GLACIAL TILL AT THE SITE OF THE FIELD WORKSHOP ON JOINTS AND FRACTURES IN OHIO TILLS. **Norman R. Fausey, George F. Hall, Jerry M. Bigham, and Ubaldo Soto, USDA, ARS, Soil Drainage Research Unit, 590 Woody Hayes Dr., Columbus OH 43210.**

Glacial till in Ohio is usually considered to be a suitable material in which to site landfills. However, detailed examination of the till typically indicates an abundance of joints and fractures that show evidence of significant water movement. To demonstrate and identify the properties of the till that relate to deep movement of water, a large pit was excavated at the Molly Caren Agricultural Center in Deer Creek Township in Madison County. The pit was 3.56 m deep with benches at 1.06, 1.86 and 2.76 m. Fractures were visible in the walls of the pit and on the benches. Samples were taken from the pit walls for bulk density, particles size analysis, clay mineralogy, and composition of the coatings on the fracture surfaces. Hydraulic conductivity was measured using a shallow well pump-in method. One measurement was made within a ped prism defined by fractures and another measurement was made on the intersection of five fractures to quantify the relative rates of water movement within the dense till and in the fractures. The till was highly uniform with depth (loam texture) and had highly calcareous gray coatings on the fracture surfaces. Saturated hydraulic conductivity within the till was approximately 0.006 cm/hr and within the fracture was approximately 0.026 cm/hr. These observations reinforce the need for more extensive site exploration and description to characterize the potential for water movement in the glacial tills in order to make sound, informed land use decisions.

2:45 BREAK

3:00 BOSTON TILL IDENTIFIED AS LOWER TILL OF UPLANDS, WEST SIDE OF MAD RIVER, NORTHERN CLARK CO., OHIO. **Julie Weatherington-Rice, Bennett & Williams, 2700 E. Dublin Granville Rd. Suite 400, Columbus OH 43231.**

A pit was dug in uplands west of Tremont City to investigate the till unit providing the barrier between a landfill bottom and a sand and gravel aquifer. Till contains stress fractures striking N50E and N45W and polygonal fractures. Paleosol clasts and highly weathered crystalline cobbles are incorporated in lodgement till. Till is 10YR4/3 (brown) to 10YR5/4 (yellowish brown), oxidized; 2 pebble counts average 7% crystalline (one pebble resembled a quartzite "Sharon egg"), 4% sandstone, 5% shale and 86% carbonate/chert. Sand/silt/clay of the loam till are 34.5%, 46%, and 19.5%; clays are 40-55% illite, 10-15% vermiculite, 10-25% kaolinite, 5-10% chlorite and 5-10% quartz/feldspar; 12% calcite, 28% dolomite and 42% CCE. Paleosol fragments, weathered cobbles and stratigraphic position place the unit at the base of the Late Wisconsinan; clay mineralogy matches Boston Till of Highland Co. The "Sharon egg", sandstone, and red shale pebbles support a NE source. The northern extension of the Mt. Olive/Vandervort Moraine and striae in Greene Co. place the unit boundary near the Clark/Miami Co. line, west of the site.

3:15 THE USE OF GIS TO MANAGE, ANALYZE, AND VISUALIZE, DATA COLLECTED DURING AN INVESTIGATION OF A PROPOSED LANDFILL. **Anthony W. Catalano, Ming Zhang, Julie Rice, 1503 Brookforest Dr., Columbus, OH 43204.**

GIS was used during a hydrogeological investigation of a proposed landfill site, in order to visualize the spatial relationships between the various geological, hydrological, and geographic features as they relate to the proposed landfill. The proposed landfill site is adjacent to the Mad River valley immediately west of Tremont City in Clark County, Ohio. The landfill is situated upland approximately 130 ft. from the Mad River valley, atop and next to two major aquifers and several sand seams. Field studies included mapping springs and seeps, and constructing a test pit on property adjacent to the proposed landfill site, in order to confirm and map the orientations of fractures within the till unit under the proposed landfill. Concurrent with the fieid studies, was the development of the GIS for the study area. ArcInfo was used to interpret the GISOM DLG data and produce output coverages manageable by ArcView. These coverages included drainage, hypsography, townships, a static digital elevation model, 3-D perspective views, and a computer generated video of the terrain. Once the field data became available, photographs and a CAD map of the test pit were produced and imported into ArcView, along with the locations and descriptions of the springs and seeps. With the GIS system complete, active visualization of the landfill in relation to the aquifers, sand seams, springs, seeps, test pit, terrain, and Springfield well field could be achieved and easily understood. The completed ArcView managed GIS, was used interactively during a presentation at the Ohio EPA and likewise used in a legal environment to help make scientific arguments about environmental issues affecting proposed landfill location.

3:30 REGIONAL GROUNDWATER FLOW IN THE DENISON UNIVERISITY BIOLOGICAL RESERVE. **Paula M. Konfal (Dr. Karl Korfmacher), Geology/ Geography Dept., Denison University, Granville, OH 43023.**

An observational study of groundwater hydrology in the Denison University Biological Reserve (DUBR) is being conducted for application to a GIS-based groundwater flow model of the area. The study is focused on Spring Peeper pond, a small man-made pond located at a topographic low surrounded by gently sloping, glaciated terrain typical of Licking County. Data collection includes daily and weekly monitoring of water table elevation in eleven wells, periodic water quality assessment of nitrates, phosphate, and dissolved oxygen (surface water only), and creation of a digital elevation model for use with GIS. Spring Peeper Pond contains water year-round, unlike other ponds of similar size in the DUBR. Therefore, it is hypothesized that 1) groundwater from the small catchment under observation directly contributes to the water elevation in Spring Peeper pond, and 2) the rate of rise and fall in pond elevation is proportional to the rise and fall of water table elevation observed in the wells. Data collected will be integrated with GIS to model groundwater flow level and direction to assess the relative impact on Spring Peeper pond.

3:45 WISCONSINAN GLACIAL LITHOSEQUENCES FROM THE TRIANGLE LANDFILL, BUCKSKIN TOWNSHIP, ROSS COUNTY, OHIO. **Brian D. Begley and John P. Szabo, Dept. of Geology, University of Akron, Akron OH 44325-4101.**

Variable glacial lithosequences near the terminus of the two most recent Pleistocene glaciations suggest that numerous ice-front advances and retreats shaped the topography of the Lattaville Moraine. Seven test wells located within the 3-km2 Triangle Landfill site average 22 m deep, and were sampled at 0.3-m intervals. Textural analyses, fine-carbonate and clay mineral contents, and stratigraphic relationships of samples allow for differentiation of four lithosequences, A through D. The lithosequences tentatively may correlate to the established classical stratigraphy of the area, where A = Caesar till, B = Boston till, C + Rainsboro till, and D = pre-Rainsboro till. Two prominent sand layers run discontinuously over the site at elevations of 268.2 m and 280.4 m. Variations in hydraulic conductivity are controlled by buried weathered surfaces, joints, and vertical and horizontal spatial trends in the lithosequences due to various depositional and post-depositional processes.

EDUCATION DIVISION

Session 14

Education: Applications for Effectiveness of Instructional Delivery

01:30PM Saturday, April 4, 1998

Johnston Hall 203

Janet E. Hurn - Presiding

1:30 INTEGRATING ACTIVE LEARNING AND CRITICAL THINKING INTO A WHOLISTIC APPROACH TO TEACHING INTRODUCTORY BIOLOGY COURSES FOR MAJORS. **Dr. Philip C. Whitford, Biology Department, Capital University, 2199 East Main Street, Columbus, OH 43209.**

In 1995/96 Capital University changed its biology majors curriculum to a two semester comprehensive introductory course format with set learning outcomes designed to assure that all students had a uniform knowledge base to build upon in upper level courses. Integral to that change was redesign of lab exercises and production of new lab manuals that revisited concepts from lecture in the preambles to each lab topic. Requirements for students to follow extensive text description and make their own illustrations replaced most predrawn diagrams and forced students to take a more active role in the learning process. Open ended critical thinking questions integrating topics from lab, lecture, text and current journals were assigned every 3 4 weeks. Comparison of first and second semester responses to these questions evidenced substantial improvement in student's ability to understand, retain and synthesize biological concepts. Informal interviews of faculty in 1996 & 1997 indicated a strong concensus that upper level students who had completed this new course series were far better able to grasp and apply new biological information within broad ecological and evolutionary framework than were students of prior classes.

1:45 EXPANDING THE COLLEGE BIOLOGY LABORATORY - MAKING USE OF COLUMBUS' METRO PARKS FACILITIES. **Kerry L. Cheesman and Terril J. Long, Biological Sciences Dept., Capital University, 2199 E. Main St., Columbus OH 43209.**

The preparation of students for the teaching profession is a difficult task. Variations in classrooms, facilities, and resources exist in schools where they will teach. Science education for these students must therefore involve exposure to resources and ideas which can help them when they begin their teaching career. While our labs are well equipped to teach basic biological, ecological, and geological concepts, integration of these concepts often works best with an off-campus field experience. Our biology course for education majors has been designed to show prospective teachers the local resources and field experiences which can be used to integrate science with their students. Lab experiences have been adapted to make use of the Columbus Metro Parks facili-ties, materials, and educational programs. Regular field trips to local parks enable students to know what resources are available, and who to contact about using them. Also, by taking advantage of Metro Parks nature programs as part of the course, students are able to

study biology in context as well as to see the connection between the facilities available and the ways in which those facilities can be utilized to enhance their classrooms. The wide variety of park facilities available in the Columbus area, along with the variety of teaching programs conducted (botanical, zoo-logical, environmental, and geological), make this resource an excellent way of training future classroom teachers.

2:00 UTILIZING THE WEB TO BOLSTER THE BASICS IN AN INTRODUCTORY PHYSICS COURSE. **Janet E. Hurn, Miami University Middletown, 4200 E. University Blvd., Middletown, OH 45042.**

By putting Authorware created tutorials on the Web to reinforce basic concepts, more in-class time can be spent on in-depth topics in my introductory physics course. Authorware creates interactive multimedia computer presentations. Topics such as vectors, the metric system, units, spreadsheets, and graph interpretation take up valuable time better spent on new physics topics. These tutorials cover these materials and are then delivered via the Web using Shockwave by Macromedia. More physics topics can be covered in the same amount of class time. Student learning increases. Student interest and participation is greater. Students are given more flexibility and involvement in the learning process. Students can repeat lessons that are unfamiliar to them. By including quizzes at the end of each unit, the students can immediately be aware of their proficiency on that topic. Initially the students have not all taken advantage of these tutorials. The reaction is similar to taking advantage of office hours. Some students will occasionally try the tutorials, but overall they are not using them unless a "reward" is associated with trying the activities. Those students that have tried the tutorials have found them to be very helpful. Making the tutorials an assignment would make evaluating their effectiveness more accurate.

2:15 TIPS FOR PRODUCING A FIELD-BASED EDUCATIONAL VIDEO. **Carol E. Landis, Linworth Alternative Program, 2075 W. Dublin-Granville Rd., Worthington OH 43085 and Garry McKenzie, Geological Sciences, Ohio State Univ., Columbus OH 43210.**

Videotape footage and other images from a field course for Bahamian teachers and officials was used to produce a 13 minute tape summarizing the efforts of BREEF (Bahamas Reef Environment Educational Foundation) to promote environmental education and sustainability in The Bahamas. Strategies can be adopted that will increase the efficiency and quality of videotaping, selection, and production, as well as the re-use of original footage. Producers must be aware of all the available imagery (logged by minute and second) and work from an approved script and storyboard. Permissions must be obtained and credits offered. All file names should use numbers, for easy sorting. A database should be used to store information about the sources, sizes, and contents of image and other files. Audio, video, and stills or text must be coupled effectively. Access to a high-end multimedia preparation program or service allows the producers to view the layout, and to develop transitions between the segments. Temporary storage and backup of files on large capacity diskettes (or CDs) facilitate transportation and protection of the work in progress. Preliminary productions should be viewed by nonparticipants for objective feedback. Prompt and clear communication and agreement on software and format preferences are necessities in production collaboration. Advances in software and hardware make quality educational videos possible at a reasonable cost.

2:30 CHANGING THE WORLD WITH MATH, SCIENCE AND TECHNOLOGY. **Frederick J. Thomas, Robert A. Chaney, Surinder Jain and Barbara Adams, Sinclair Community College, 444 W. Third St., Dayton OH 45402-1460.**

Mastery of fundamental competencies in math and science gives students-especially minority students-far greater opportunities to succeed in more advanced education or in high-paying careers. ACTSAMC, "Advanced Competencies for Technical, Scientific and Mathematical Careers," is an experimental, project-based program at Sinclair Community College which links broad technical, scientific and mathematics skills in job-related contexts. One tangible focus of the project is SAM, an inexpensive, calculator-controlled robot. Created by faculty from physics, math, electronics technology, and developmental studies, SAM is a shared tool which empowers students to apply basic principles and processes. Programming in the language of algebraic functions, students teach SAM to move, respond to stimuli, escape from a maze, and carry out other activities. They learn to use math, science and technology to make things happen.

2:45 GEOLOGY, THE BASIS OF OHIO'S BIODIVERSITY. **Jane L. Forsyth, Geology Dept., Bowling Green State University, Bowling Green, OH 43403.**

The geology of Ohio is remarkedly simple, though it seems confusing to many because the many different geologic events occurred at so many different times. Keeping track of the sequence of all these events is as basic to a real understanding of Ohio's geologic history as it is to a study of human history. Knowledge of Ohio's geologic history is important, for this history has determined the nature of the modern landscapes and soils throughout the state, which in turn has controlled the distributions of native plants and animals, as well as the events of human history and modern land uses here. In addition, geologic history is fascinating in itself, a story of evolving seascapes and landscapes through time, each stage populated by different evolving life forms. Educating non geologists of all ages about this history is truly rewarding, if it is presented in a way that effectively communicates, if it begins with what folks already know - beginning "where they are". Presented thusly, the geology of our state, its past and present, can truly come alive for them. How to accomplish this is the subject of this talk.

3:00 FOUNDATIONS COURSE IN SCIENCE FOR ELEMENTARY EDUCATION MAJORS. **Beth I. Basista and David P. Caine, Dept. of Physics, Wright State University, Dayton OH 45435.**

A Foundations course forms the basis for the elementary education science program by providing entering students with a philosophical and experiential understanding of constructivist, cooperative classroom environments. Through inquiry activities, students develop in-depth understanding of fundamental science topics and applications, science process and mathematical skills. Specific science topics covered are properties of matter, temperature and heat. Two quarter results yield pre-/post-test gains of 50-70%. A constructivist learning environment survey, ranked from zero, traditional class, to 4, extreme constructivist class, was issued in three forms. These refer to student experiences in this course, in prior science courses, and to student expectations of their future practices as a teacher. Preliminary results showed that this course was ranked at 2.7 while previous science courses were ranked at 2.3, indicating this course was perceived as a constructivist course. The future teaching expectations of the students overlapped the ranking of the course, indicating the course overall matched the students' intended constructivist teaching practices.

3:15 THE EVALUATION OF SCHOOL-UNIVERSITY PARTNERSHIPS. **Dianne A. Brown Wright and Kimberly S. Peer. Department of Educational Foundations and Leadership, College of Education, University of Akron, Akron, OH 44325-4208.**

Developing partnerships with primary and secondary education is a dominant theme for colleges and universities across the U.S. that was barely on the horizon in the early 1970s. The purpose of this paper is to present the results of a survey of over 150 school-university partnerships in a selected region of Northeast Ohio. These school-university partnerships are described in terms of their diversity and scope. Researchers also share findings relative to school-university partnership funding and evaluation results. Overall findings indicate that while diversity and effectiveness are contended, both are somewhat lacking based on available empirical evidence. This circumstance is further aggravated by the fact that evaluation designs and results are often poorly constructed, if not lacking altogether. The researchers provide recommendations related to accountability and evaluation design.

ENGINEERING & TECHNOLOGY DIVISION

SESSION 15

Engineering: Simulation, Chemistry & Communication

03:00PM Saturday, April 4, 1998

Johnston Hall 115

Luigi Messineo - Presiding

3:00 SIDE IMPACT AUTOMOBILE COLLISIONS: SIMULATION OF VEHICLE AND OCCUPANT RESPONSE. **Cesar A. Grau and Ronald L. Huston, Institute for Applied Interdisciplinary Research, PO Box 210072, Cincinnati OH 45221-0072.**

Side impact automobile crashes are among the most common of all urban vehicle accidents. They typically occur at intersections. The proximity of the struck vehicle occupants to the striking vehicle makes the occupants particularly vulnerable to injuries. This paper presents a comprehensive simulation of the occupant and vehicle dynamics in side impacts. Several methods of validating this simulation, including analytical, numerical, and experimental techniques are also presented. The results provide a representation of the occupant movement at each instant of the accident sequence. Designs for injury reduction are suggested.

3:15 AN ANALYSIS OF THE THEORY OF THE CHEMICAL HARD DRIVE. **John M. Jamail, PO Box 12, Cambridge OH 43725.**

The principles behind the chemical hard drive are actually quite simple. The hard drive stores memory by reading charges of phosphor packets on a data grid. The charge is imparted to these phosphors by means of an oxygen-iodine laser. This laser beam travels through six chemical mixing trays. As the beams pass through the trays the refraction indices alter and modulate the wavelength it will impart onto the phosphor cluster. The wavelength it imparts onto the phosphor represents a stream of ones and zeros (binary language). Ideally the chemical hard drive could store over one terabyte or one trillion bytes of information. This represents a major advancement over conventional hard drives. The conventional hard drive has a spinning platter on which an electromagnetic signature is written by a read/write head. Later when this information is requested, the read/write head searches the disk for the signature. The chemical hard drive has the fundamental advantage since the information is written directly onto a matrix, therefore making seek time (time spent searching for information) negligible. This makes the chemical drive more similar to an Solid State Disk Drive than an electromagnetic hard drive, but less expensive and with a larger capacity than both. The goals of this project are to develop a theory that could make this technology a reality. Obviously there are many questions that need to be answered but this technology has potential.

3:30 MICROPROCESSOR DESIGN RELIABILITY. **Anthony P. Messuri, Youngstown State University, College of Engineering and Technology, Youngstown OH 44555.**

The higher degree of architectural complexity evolving in present-day microcomputer systems has brought an increased demand for fault tolerant features in the system design strategy. Technological advances now make it economically feasible to design and manufacture integrated circuits having a large number of gates per chip. This increased level of integration has the advantage of allowing increased complexity in design and having only a small impact on the cost. The disadvantage is that this increased complexity can result in a design where fault detection becomes extremely difficult. A microcomputer system made up of IC logic components with Very Large Scale Integration (VLSI) would allow for increased fault tolerance by placing duplicate circuitry on the same chip. Careful consideration of how the system is partitioned can avoid the pin limitation problem and allow advantageous use to be made of the available chip area. This design would improve the system's fault detection characteristics by adding significant portions of logic for such things as fault detection and fault isolation without drastically increasing manufacturing costs. In turn, greater reliability would allow for less expensive maintenance and a reduction in costly system downtime. Thus a fault tolerant design can result in a computer architecture that is affordable as well as dependable.

3:45 A METHOD FOR ARGININE, L.Messineo and N.Steiger, BGES Dept., Cleveland State University, 2329 Euclid Ave., Cleveland, OH 44115.

We have found that sodium dichloro-s-triazinetrione dihydrate can substitute sodium hypochloride in the Messineo (*Archiv Biochem and Bioph.* vol 117, 534, 1966) modification of the Sakaguchi reaction for free and bound arginine. Since sodium dichloro-s-triazinetrione dihydrate comes in powder, molar solutions of it can be made easily, and both the naphthol reagent and the arginine determination becomes more reliable. The naphthol reagent is prepared by dissolving 280 mg. of 2,4-dichloro-1-naphthol in 50 ml of absolute ethyl alcohol and 50 ml of 5.0 M KOH. This solution is then mixed with 100 ml. of 0.0131 M sodium dichloro-s-triazinetrione dihydrate. Sodium potassium tartrate (2 grams) is added to stabilize the reagent that otherwise would become dark brown. Solutions of naphthol treated this way are reddish and stable. The test is done by adding to one ml of any solution containing 50 ug or less of arginine, 0.5 ml of this reagent, 0.5 ml of 0.0044 M sodium dichloro-s-triazinetrione dihydrate and 0.5 ml of 0.0047 M KI. Arginine gives a reddish color and an absorption spectrum, which peaks in 10 minutes at 520 nm. The response is linear, proportional to the content of arginine and stable for hours. The arginine content of bovine albumin, lysozyme and trypsin was found to be 6, 13.2 and 3 percent respectively. These values are close to reported value in the literature. This method compares favorably with other methods of determination of arginine and is easier to use and prepare.

4:00 COMMUNICATION INTENSIFICATION OF TECHNICALLY- ORIENTED COURSES: AN EXAMPLE IN OPERATIONS. Alan D. Smith, Robert Morris College, 600 Fifth Avenue, Pittsburgh PA 15219-3099.

Much of the current literature on industrial needs of business graduates points to the deficiency of basic communication skills in presentation, written, and report communication. Many of these skills need to be developed within the context of the subject matter of the traditional business disciplines. An example of the communication intensification within a technical subject was made with operations management since it is considered integral to the financial accounting, control, and marketing functional areas of business and communication. Specifically, Communication Skill Goals of Years 3 and 4 — established for the whole institution and which included: Skills for critical reading, research and thinking; skills for communicating; and skills for communicating in groups — were integrated with the major course goals in operations management. Through the use of authentic assessment and ABCD (audience, behavior, conditions, and degree) structure, all of the various goals were operationalized and cross-tabulated with subject matter, with emphasis on measurement rubrics and institutional technology schemes. Through development of communication and course goals, matrices, and actual assignments, readers are shown how communication outcomes are enhanced and measured.

ENVIRONMENTAL SCIENCE & RESOURCE MANAGEMENT DIVISION

SESSION 16

Environmental Science & Resource Management

09:00AM Saturday, April 4, 1998

Johnston Hall 115

Charles A. McClaugherty - Presiding

9:00 ACTIVATED SLUDGE TREATMENT OF OIL REFINERY WASTEWATERS. Yung-Tse Hung and Mario G. Cora, Civil Engineering Dept., Cleveland State University, Cleveland OH 44115-2440.

This paper examined the application of activated sludge process in treating oil refinery wastewaters. The refinery wastewater contained high concentrations of COD, TDS, heavy metals, other compounds inhibitory to biological treatment, and toxic organics. The wastewater also had high COD/BOD ratio. Current treatment techniques include equalization, pH adjustment, flocculation/coagulation, primary settling, flotation, oil separation, and biological treatment processes, which include trickling filters, activated sludge, aerated lagoons, oxidation ponds, and anaerobic treatment processes. The most commonly used biological treatment process is the activated sludge process. For refinery wastewater with influent COD of 715 mg/L and BOD of 140 mg/L, activated sludge could remove 65.7% COD and 85% BOD and produced an effluent of 245 mg/L COD, 21 mg/L BOD, 42 mg/L TSS and 29 mg/L VSS. The NH4-N was reduced from 12.8 mg/L to 0.45 mg/L. The design parameters for refinery wastewater treatment included a hydraulic detention time of 10 to 22 hours, COD loading rate of 0.18-0.40 g COD/g VSS-day, and BOD loading rate of 0.04-0.08 g BOD/g VSS-day.

9:15 PHOSPHORUS DYNAMICS IN LAKES: THE ROLE OF BACTERIA IN PHOSPHATE UPTAKE. Xueqing Gao, Robert Heath, John McGreevy, and Kenneth Rosenthal, Dept. Biol. Sciences, Kent State University, Kent OH 44240.

Identifying those organisms most actively involved in uptake of phosphate, frequently the limiting nutrient in aquatic communities, is necessary for scientific and practical purposes. We studied this in Lake Erie and several other lakes with varying concentrations of phosphate in summer using radiometric methods. Based on gross uptake rates, bacteria appear to dominate phosphate uptake in aquatic communities: ranging from 60 to 90% taken up per minute. By contrast, net phosphate uptake by bacteria was much slower, indicating that natural bacteria rapidly release much of the phosphate they take up. We found that from 27-99% of the phosphate taken up by natural bacterioplankton assemblages was rapidly released. Because earlier studies relied only on estimates of gross uptake, our finding shows that the importance of bacteria in P-dynamics in natural waters needs to be re-examined. This study was supported by Ohio Sea Grant.

9:30 TREATMENT METHODS FOR POLLUTANT REMOVAL FROM OIL REFINERY WASTEWATERS. Yung-Tse Hung, Chatchawal Lersspochawanich, Civil Engineering Dept., Cleveland State University, Cleveland OH 44115-2440 and Ruth Yu-Li Yeh, Chemical Engineering Dept., Ming-Hsin Engineering College, Hsinchu, Taiwan.

This paper examines the treatability of refinery wastewater streams by a pilot scale activated sludge plant and to develop the process design parameters for a full scale plant design. Among various treatment methods used in the removal of organic pollutants present in the oil refinery wastewaters, the activated sludge process was found to be the most feasible treatment method. A total of 6 pilot scale activated sludge reactors were used in the pilot plant study. The raw wastewaters had a COD (chemical oxygen demand) of 3366 to 4069 mg/l. Experimental parameters investigated included MLSS (mixed liquors suspended solids), F/M (food to microorganisms) ratio, and temperature. Three MLSS levels used consisted of 1000, 2000, and 3000 mg/l. The hydraulic detention time in the pilot scale activated sludge plant was maintained at 1 day for all reactors. There was two operating temperature: 5 to 7 C and 20 C. Results showed that sludge yield coefficient and the endogenous decay coefficient was 0.74 lb MLSS/lb COD removed, and 0016 per day, respectively. The BOD (biochemical oxygen demand) and COD removal efficiencies averaged 94.5%, and 79.7%, respectively, for the high temperature reactors. For the low temperature reactors, the corresponding removal efficiencies were 73%, and 65.5%. Results indicated that the organic pollutant removal efficiencies decreased in the winter temperature conditions. Based on the pilot study the following parameters were recommended for the design of full scale treatment plant: F/M ratio of 0.117 lb COD removed per day/lb of MLSS, 0.5 day hydraulic detention time, BOD loading rate of 0.004 lb BOD/1000 cu. ft. per day, and sludge age of 15.8 days. The pilot plant study indicated that the plant was capable to meet effluent quality standards.

9:45 DAMMING EFFECTS CAUSED BY CONVENTIONAL ROADS WHICH CROSS A RIVER'S FLOOD CHANNEL. George L. Opdycke, 18563 Co. Rd. G, Bryan OH 43506-9404.

A conventional road which crosses a river's flood channel consists of an earthen dam with the road's surface atop. The road/dam is, purposefully, made leaky via a bridge outlet and so on. Tiffin River gauging station records have permitted the assessment of the damming effects of this design for two roads. One-hundred-ninety-six flood records were examined from Powers Gauge Station and Stryker Gauge Station. These covered a 34 year time period, 1942 to 1976, which straddled each road's construction, respectively, the Ohio Turnpike, completed in 1955, and State Route 191, completed in 1957. Both roads cross the entire Tiffin River flood channel. Evaluations were made of flood height and flow changes which occurred following road completion. Evaluations were made of flooded area change by coupling flood height changes with professional engineer's flood area measurement data. It was found that the Turnpike road/dam, during periods of extreme flood, causes a 25% flow decrease, a one foot flood height increase, and a 740 acre flooded land increase. Correspondingly, the Rt. 191 road/dam, near Stryker, Ohio, causes a 35% flow decrease, a two foot flood height increase, and a 530 acre flooded land increase for the Tiffin River. Lesser floods provided smaller estimates.

10:00 FILAMENTOUS MICROORGANISMS IN ACTIVATED SLUDGE PROCESS. Yung-Tse Hung, Majid Zarrinafsar, Civil Engineering Dept., Howard H. Lo, Geology Dept., Cleveland State University, Cleveland OH 44115-2440.

This paper reviewed the sludge bulking and control of filamentous microorganisms in activated sludge process. Activated sludge bulking usually is caused by excessive growth of filamentous microorganisms which interfere with sludge settling. The objective of the study was to examine the excessive growth of filamentous microorganisms in completely mixed pilot reactors. The volume of rectors were 5 L each. The COD (chemical oxygen demand) of influent

was 700-900 mg/L. The DO (dissolved oxygen) was 4 mg/L to prevent low DO bulking. The F/M (food to microorganisms) ratio was 0.2 to 0.3 COD/g MLVSS-day, and the sludge age was 20-30 days. The operational temperature was 20 C. The microorganisms showed a high affinity for acetate and, as Ks=0.07 mg Hac/L, Umax =3.75/day and low decay rate Kd=0.03/day. The same filamentous microorganisms showed high affinity for glucose and lactose (Kd<1). At low F/M ratio the filamentous microorganisms grew on reduced inorganic sulfur compounds in the presence of degradable soluble carbonaceous waste. At limited concentration of ammonium, the filamentous microorganisms, successfully competed against the activated sludge floc forming bacteria resulted in poor sludge settling in the settling tank. Based on the results of this study, it is recommended that a selector, a mixing zone for primary effluent and the return activated sludge to the activated sludge treatment system, be added in order to prevent the sludge bulking problem in the activated sludge reactors.

10:15 A BIOLOGICAL, CHEMICAL AND ENVIRONMENTAL ASSESSMENT OF A PARTIALLY IMPOUNDED CREEK IN BROWN COUNTY, OHIO. **Greg S. Stroup (Mary M. Riestenberg), Dept. of Biology, College of Mt. St. Joseph, 5701 Delhi Road, Cincinnati OH 45233-1670.**

White Oak Creek, whose flow is periodically impeded by natural and manmade physical barriers, supports a diversity of species and serves as a source of recreation and game fishing. My research involves stream testing at sites ranging from suburban to agricultural areas and includes assessing microbiological, macrobiological, chemical and physical factors which reflect the quality of the creek from the point of its origin near Sardinia to its mouth at the Ohio River. The creek has a known source of point pollution in the form of a sewage treatment plant on Sterling Creek, a small tributary which empties into White Oak Creek near Sardinia, and its nonpoint sources of pollution are associated with local agricultural practices as well as the Ohio River. I am assessing the stream's physical properties with special emphasis on its seasonal and permanent impoundments in order to determine the relative effects of the stream's partitioning, as well as its chemical parameters, and aquatic diversity at five sites at two-week intervals from autumn until early spring. I hope to determine the combination of factors which most likely control this stream's health. Early data analyses suggest that the Ohio River has a dramatically strong impact on its tributary's well-being.

10:30 TREATMENT OF METAL INDUSTRIAL WASTEWATERS WITH AQUATIC PLANTS. **Yung-Tse Hung, Supara Leaungpattarawong, Civil Engineering Dept., Cleveland State University, Cleveland OH 44115-2440.**

This paper examined the application of aquatic plants in the treatment of metal industrial wastewaters. Metal industry is one of the industries that discharged a large quantity of wastewater and contains heavy metals that are toxic to human even a low concentration. Experiments were conducted in plastic tubs. The aquatic plants were exposed separately to the individual metal ion solution at various concentrations. The aquatic plants were weighed and analyzed for metal concentration at various time of experiment. Results showed that *Salvinia* and *Spirodela* removed 56-96% of soluble Cr, Ni of initial concentration of 1 to 8 mg/L in the first 2 days. The removal rate decreased with increasing in the contact time. Five day old aqua-cultured *Brassica juncea* seedlings removed 40-50% dissolved Cd for a broad range of Cr concentration of 0.18- 18 micro M, in 24 hours contact time at a biomass loading of 0.8 g/L. Using the same environmental conditions, the live roots of *B. juncea* incubated in 500 mg/L Pb solution for 3 days removed Pb equivalent to 45% of their dry weight. The recovery of heavy metal in *B. Juncea* in roots was 45.9%, 55%, 50.9%, 44.9%, 97.5%, and 100% for Zn, Cd, Cr, Ni, Cu, and Pb, respectively, while the corresponding bio-accumulation coefficient was 131, 134, 179, 208, 490, and 563. Based on the results of this study aquatic plants were found to be effective in removing heavy metal from metal industrial wastetwaers.

10:45 THE IMPACT OF HABITAT RESTORATION ON THE SMALL MAMMALS OF BIG ISLAND WILDLIFE AREA, MARION COUNTY, OHIO. **Jeffrey D. McClellan (Dr. Carl W. Hoagstrom), Dept. of Biological Sciences, Ohio Northern University, Ada OH 45810.**

Small mammal populations and communities were studied at the Big Island Wildlife Area, Marion County, Ohio. The survey is part of a long-term study to ascertain the impact of prairie and wetland restoration on these communities. The Ohio Division of Natural Resources plans to convert some recently acquired agricultural fields at Big Island to prairie and wetland environments. The study will continue as these restorations progress. Trapping was initiated in July 1997, when lines of 15 to 30 Sherman folding live traps were set and checked four times over a 36 hour period. The lines were set in agricultural fields, a field already planted to prairie plants, an abandoned field and along the edge of a riparian woods. This procedure was repeated in August. Preliminary results suggest that the agricultural and abandoned fields are less important to the small mammals than are the woods edge and planted prairie, and that the planted prairie is as important to the small mammal community at Big Island as any habitat trapped.

SESSION 17

Environmental Sciences & Resource Management

01:30PM Saturday, April 4, 1998

Johnston Hall 115

Tracy L. Engle - Presiding

1:30 ODOR CONTROL IN SLUDGE COMPOSTING FACILITIES WITH BIO-FILTER. **Yung-Tse Hung and Supara Leaungpattarawong, Civil Engineering Dept., Cleveland State University, Cleveland OH 44115-2440.**

This paper examines the use of bio-filter in odor control in composting facilities. Odors from composting sludge has been a problem for a long time. The sewage sludge contains high concentration of odorous compounds including ammonia, inorganic sulfur, organic sulfur, aliphatic fatty acids, amines, and aromatics. During sludge composting operation the odor may be produced from curing and storage of compost. Bio-filter has been used in treating low concentration of highly odorous compounds and air pollutants from wastewater facilities, solid waste processing plants, rendering plants, and chemical manufacturing plants for over 20 years. The use of bio-filter for odor removal was evaluated in the sludge composting facility at Water Pollution Control Facility in Dartmouth, Massachusetts, which had an average daily wastewater flow of 4.2 MGD and a maximum hourly flow of 10.3 MGD. The bio-filter had a surface area of 1798 m^2 and a filter media depth of .9 m. The detention time in the bio-filter was 45 sec at an influent air flow rate of 11,300 L/s with a surface loading rate of 20.2 L/sec-m^2. The actual air flow rate to the bio-filter during the 12 month testing period was 5228 L/sec. The bio-filter removed 55% dimethyl sulfide, 17% dimethyl disulfide, 90% methanethiol, and 70% NH_3. The bio-filter is effective in removing odors, reduced sulfur compounds, and ammonia in a sludge composting facility.

1:45 FOOTPRINTING NORTHEAST OHIO: ACCOUNTING FOR ECOLOGICAL IMPACTS. **George Pomeroy, Department of Public Administration and Urban Studies, University of Akron, Akron, OH 44325-5005.**

In attempting to incorporate biodiversity and sustainability into planning, a number of planners have adopted Ecological Footprint Analysis as a planning technique. Ecological Footprint Analysis is an accounting tool that allows us to estimate and better evaluate the environmental impacts our communities make in terms of spatial dimensions. In this paper northeast Ohio is the area of analysis. It is assumed that the ecological deficit of several local communities can be better ascertained by utilizing this methodology. Once the magnitude and nature of these deficits is determined, better planning and policy actions may be taken to reduce the footprint that our communities leave on the environment.

2:00 THE IMPACT OF SEWER LINE INSTALLATION ON THE RESTORATION OF WETLAND VEGETATION. **Sarah J. Reymann and Donald R. Geiger. University of Dayton, Dept. of Biology, Sherman Hall rm. 222, Dayton, OH 45469-2320.**

Approximately 90% of Ohio's wetlands have been lost due to habitat destruction since settlement. To prevent loss of a wetland through damage to hydrology, soil and vegetation, we worked closely with the construction team throughout the installation of a sanitary sewer system. This study evaluates the effectiveness of preventative and curative measures intended to mitigate damage during construction and to rehabilitate afterward. Examination of water table levels indicated the east zone had a reliable groundwater source while the level of the middle zone fluctuated mildly and that of the west zone depended strongly on precipitation. The impact of construction on hydrology resulted in differences along the disturbance zone as evaluated by the wetland indicator status of the most dominant and frequent species. Based on the ranking OBL=+5, FAC=0, UPL=-5, etc., the east zone averaged 5.2, the middle zone averaged 9.8, and the west zone -8.4 on the wetland index. Native species were most common throughout the sampling period, ranging from 55.1% to 84.7% of the species present. Most of the native species were perennials, ranging from 63.5% to 73.5%. The patterns of vegetative regrowth indicate a rapid return toward a stable community within the second year after disturbance, suggesting that the preventative methods taken during construction ameliorated changes in soil and hydrological conditions.

2:15 URBAN GROWTH: THE NEED FOR TRANSPORTATION PLANNING IN THE AKRON METROPOLITAN AREA. **Samuel Thompson, 525 Carroll St. 2F, Akron OH 44304-1960**

The general welfare of any metropolitan area is dependent upon maintaining an adequate and efficient transportation system. As a result of increasing congestion, air pollution, environmental degradation, and urban sprawl, it becomes clear that land use changes are responsible for the transportation difficulties. In order to mitigate the difficulties, there is the need to plan transportation for present and future development. The premise of this paper was the establishment of a correlation between land use types and transportation in Portage County, Ohio in 1996. The methodology was divided into three phases: compiling aerial photographs; surveying; and coding. As a result of this methodology, the findings produced a picture of existing regional conditions, and provided a basis for analyzing and understanding relationships between land use types and transportation. Also, summaries of developed land use, vacant undeveloped land use,

dwelling unit types and nonresidential floor space were provided. The information was then compared to data gathered in 1970 and 1990 to identify possible trends. While this is a preliminary study, it is obvious that land use types impact transportation. It is hoped that the data will guide the staged development of a balanced transportation system in concert with the existing and future development of the area to efficiently serve the transportation needs of the Akron Metropolitan Area.

MEDICAL SCIENCES & HEALTH TECHNOLOGIES DIVISION

SESSION 18

CLINICAL & EXPERIMENTAL PHYSIOLOGY

09:00AM SATURDAY, APRIL 4, 1998

JOHNSTON HALL 018

STEVE R. CHANNEL - PRESIDING

9:00 DIETARY HABITS AND MODIFICATIONS, AND NUTRITION PERCEPTIONS OF ELDERLY PEOPLE. KIM BARRETT, MARCIA IRWIN, TRACY WHITTAKER, AND DIANA SPILLMAN 701 WEST CHESTNUT, #7 OXFORD, OH 45056

The purpose of this study, in progress, is to examine the dietary habits and modifications, and nutrition perceptions of elderly people. The sample population includes approximately 100 people from the southwestern Ohio area. The study design is descriptive and involves the use of a two page survey that includes questions on diet modifications, food purchase and preparation, eating out habits, diet changes since childhood, the food guide pyramid, and perceptions of a healthy diet and food selections today along with demographic summary questions. Preliminary findings show that the sample is mostly 60-80 year olds (64%) and female (65%). Fifty percent of the sample population has heard of the food guide pyramid, and 80% believe their diet has moderately to greatly changed since their younger years. The majority (65%) did not have physician ordered diet recommendations, and therefore could be on regular diets (no restrictions). The remainder had modified their diets per physician recommendation. Of those who had changed their diets per physician order, 33% were on a low fat/low cholesterol diet.

9:15 AN INVESTIGATION OF THE PREVALENCE FOR THE FEMALE ATHLETE TRIAD RISK IN COLLEGIATE PRECISION SKATERS. MARCIA IRWIN AND DIANA SPILLMAN, MIAMI UNIVERSITY, 18 PHILLIPS HALL, OXFORD OH 45056.

The purpose of this study is to investigate the prevalence of the female athlete triad risk in collegiate precision skaters. The female athlete triad is a group of inter-related medical disorders including disordered eating, amenorrhea, and osteoporosis. The subject group will be volunteers from the thirty member varsity women's precision skating team at Miami University. The research design is descriptive and will be given in two parts. The first part is self-report questionnaires including the 90 question Eating Disorders Inventory (EDI) and a modification of the EDI Symptom Checklist which has sections on weight history, dieting history, medications, exercise habits, menstrual history, bone health, diet intake (24-hour recall & food frequency questionnaire), and body image. The second part is anthropometric measurements including height and weight (to determine body mass index), wrist circumference (to determine bone frame size), waist and hip circumferences (to determine waist-to-hip ratio), and a four site skin-fold measurement (to determine body fat). The data will be assessed with t-tests, ANOVAs, and regression equations.

9:30 ANALYSIS AND EVALUATION OF SELECTED MAGNETIC RESONANCE IMAGING (MRI) VARIABILITY FACTORS USING A CERVICAL SPINE REFERENCE PHANTOM. RANDELL L. KRUGER, MICHAEL J. DENNIS, DEPT. OF RADIOLOGY, MEDICAL COLLEGE OF OHIO, PO BOX 10008, TOLEDO OH 43699-0008.

Magnetic Resonance Imaging (MRI) is the clinical imaging modality of choice in many diagnostic imaging studies, including the spine. Diagnostic cervical spine MRI image quality depends on both scanner and patient variability factors. The source of poor image quality is important information and very useful during clinical evaluation. Using a cervical spine reference phantom and modified MRI protocols, spine images are analyzed so that scanner and patient factors can be identified and isolated. A cervical spine reference phantom was designed and fabricated at the Medical College of Ohio for use with a clinical GE Signa 1.5 Tesla whole-body MRI scanner and a spine surface coil. Over one hundred clinical patients were imaged using the reference phantom. More than one thousand clinical MRI spine images were collected, evaluated, and analyzed. The performance of the reference phantom was evaluated by a team of neuro-radiologist. The reference phantom successfully identified and isolated a selected set of scanner and patient variability factors providing useful information during clinical interpretation of spine images.

9:45 HISTOLOGICAL STUDY OF THE EFFECTS OF STRESS INDUCED HYPERTENSION IN NORMOTENSIVE WKY RATS. ELLEN ANDREWS, DARCIE SMITH AND DANIEL ELY, DEPT. OF BIOLOGY, UNIVERSITY OF AKRON, AKRON OH 44325-3908.

Chronic stress has been correlated with an increase in cardiovascular disease and hypertension in animal models with a genetic predisposition for hypertension or heart disease. The hypothesis of this study was to show that cardiovascular disease and hypertension would develop in a stepwise fashion after graded chronic social stress in the normotensive Wistar Kyoto (WKY) rat. Blood pressures (BP) were taken biweekly using the tail cuff method and retroorbital blood samples were taken in the alternate weeks. Plasma catecholamines were measured by HPLC. Myocardial fibrosis and coronary collagen were studied by staining collagen with Sirius red. Three groups of WKY rats were used from 3 weeks to 30 weeks of age: caged controls = normal stress (n=9); territorial stress = moderate stress (n=12); early social isolation followed by territorial stress = high stress (n=11). The BP of the three groups was elevated in a graded fashion: controls, 124 mmHg; moderate stress, 139 mmHg; high stress, 145 mmHg. Norepinephrine levels increased from 672 pg/ml in controls to 807 pg/ml in high stress. Epinephrine increased from 457 pg/ml in controls to 1181 pg/ml in high stress. There was a dose response relationship between the stress level and the extent of cardiovascular pathology. High stress showed a 37% increase in myocardial fibrosis, a 34% increase in coronary collagen and a 167% increase in the wall to lumen ratio over the controls. In conclusion, chronic social stress increased both physiological risk factors for coronary heart disease and cardiovascular pathology (Supported by HL 48072-4).

10:00 THE EFFECTS OF THE DENTAL MERCURY AMALGAM DISPERSALLOY AND HYDROGEN PEROXIDE ON HUMAN GINGIVAL FIBROBLASTS IN VITRO. ELIZABETH C. CARDER; (SIMON K. LAWRANCE, PH.D.); OTTERBEIN COLLEGE, BOX #10316, WESTERVILLE, OH 43081-2006.

Over the years there has been increasing concern of the toxic effects of mercury amalgam as a restorative material in dentistry. Recently, the effects of hydrogen peroxide, a bleaching agent, on mercury amalgam has been examined as well. Determining whether or not these two reagents have a synergistic effect on human gingival fibroblasts is the goal of my research. The effects of hydrogen peroxide on the reactions of mercury amalgam in human cells will be studied, by comparing cells treated with mercury amalgam, cells treated with hydrogen peroxide, and cells treated with both amalgam and hydrogen peroxide. Each of the specified toxins will be added to the cells in culture and left to react for varying amounts of time. The cytotoxic effects of the reagents in each varied situation will be determined by an MTT (3-[4,5-dimethyl-thiazol-2-yl]-2,5-diphenyl tetra-zolium bromide) technique, and then the absorbancy will be measured using a spectrophotometer. Through this research I hope to provide the dental pro-fession with an increased knowledge of the effects of amalgam and H2O2 as they are used in dentistry.

10:15 HEAT SHOCK PROTEINS IN THE PATHOGENESIS OF SCHIZOPHRENIA. SARAH HANSEN, EARLHAM COLLEGE, EC DRAWER 837, RICHMOND IN 47374-4095 (UNITED STATES) AND KATHERINE JONES (ENGLAND) , IGOR LEYKIN (ISREAL)*, MEIR SHINITZKY (ISRAEL)* *WEIZMANN INSTITUTE OF SCIENCE DEPARTMENT OF IMMUNOLOGY, REHOVOT, ISRAEL

Currently there is no biochemical diagnosis or cure for schizophrenia, a disease which incapacitates 1% of the total population. Immunological abnormalities in schizophrenic patients indicates the involvement of an autoimmune response in the pathogenesis of the disease. The purpose of this study was to determine the immune response of schizophrenic patients to a protein fragment of heat schock protein-60 (hsp60). In vitro stimulation of lymphocytes and enzyme-linked immunosorbant assays (ELISA) to calculate immunoglobulin levels were used to identify immunological differences between schizophrenic patients and control subjects. A significantly increased cellular response coupled with decreased immunoglobulin levels was observed in schizophrenic samples in comparison to control subjects. The findings in this study support the autoimmune hypothosis for schizophrenia linked to the binding of the IgG and IgM to the protein fragment of hsp60.

10:30 THE EFFECTS OF SYMPATHETIC NERVOUS SYSTEM STIMULATION OF BLOOD PRESSURE AND TESTOSTERONE LEVELS IN NEONATAL NORMOTENSIVE AND BORDERLINE HYPERTENSIVE MALE RATS. JAMES P. PINETTE & DANIEL L. ELY, DEPT. OF BIOLOGY, UNIVERSITY OF AKRON, AKRON OH 44325-3908.

The objective of this study was to determine the effects of a heightened SNS and its possible mechanism of action on catecholamine, testosterone and blood pressure levels using two strains of rats: normotensive Wistar Kyoto (WKY) and a congenic strain genetically similar to WKY but having a Y chromosome from a genetically hypertensive father (SHR/y). To increase SNS activity, nerve growth factor (1.34mg/l of NGF/ 7g of body weight) was injected daily into neonatal WKY (n=6) and SHR/y (n=6) pups days 1-21. The control groups, WKY (n=7) and SHR/y (n=8), were injected daily with isotonic saline. Body weight, bp (tail cuff), serum catecholamine (HPLC) and serum testosterone (RIA) levels were monitored weekly. A significant increase in bp was seen in the WKY pups in weeks 5-7 (33mmHg, $P \leqq .0001$). The opposite effect was seen in the SHR/y pups showing a significant decrease in bp over a three week span (30.5mmHg, $P \leqq .0166$). Testosterone decreased in all weeks (5-11) in WKY strain and also decreased in all but week 8 & 10 in the SHR/y strain. No consistent differences in catecholamine were seen within strains. In conclusion, NGF heightened SNS caused a significant increase in systolic bp in a normotensive rat strain, while at the same time lowering its serum testosterone level suggesting a possible negative feedback relationship.

SESSION 19

EXPERIMENTAL PHYSIOLOGY I

02:00PM SATURDAY, APRIL 4, 1998

JOHNSTON HALL 018

JUDY ADAMS - PRESIDING

2:00 THE EFFECTS OF CONJUGATED DIENOIC LINOLEIC ACID ON TUMOR PRONE MICE. LAURA V. WELLMAN (BARRY P. WARWICK, RODNEY P. ANDERSON), DEPT. OF BIOLOGICAL SCIENCES, OHIO NORTHERN UNIVERSITY, ADA OH 45810.

The purpose of this research project was to examine the effects of a polyunsaturated fatty acid, conjugated models dienoic linoleic acid (CLA), on tumor growth in genetically altered mice prone to mammary and salivary gland tumor formation. In this model, tumor formation begins around six weeks of age. CLA had been previously shown to inhibit chemical tumorigenesis, however, its effects in the genetics of tumorigenesis have never been studied. Mice were obtained at four weeks of age and provided normal mouse chow for one week. During week two, a high saturated fat diet was administered to half of the animals, while a high unsaturated fat diet administered to the remainder. Daily food intake was recorded. For an additional fourteen days, half of each diet group were provided CLA in the diet at 0.03% (w/w). Animals were euthanised and tumors excised. High unsaturated fat-fed animals showed the highest tumor incidence, followed by high unsaturated fat plus CLA, high saturated fat alone, and finally high saturated fat diet plus CLA. Tissues are currently being fixed for histologic examination.

2:15 THE SHR Y CHROMOSOME INFLUENCES RENAL NOREPINEPHRINE RESPONSIVENESS THOUGH AN ANDROGEN RECEPTOR MEDIATED MECHANISM. AARON L. EBBS, GAIL DUNPHY, AND DANIEL ELY, UNIVERSITY OF AKRON, DEPARTMENT OF BIOLOGY, AKRON OH 44325-3908.

Results from previous experiments done in our laboratory revealed an enhanced renal norepinephrine (NE) release upon stimulation of the renal nerves in the isolated perfused kidney of twenty week old male rats with the spontaneously hypertensive rat (SHR) Y chromosome as compared to renal NE release from normotensive WKY rats. The hypothesis of the following study was that the SHR Y chromosome influences renal NE responsiveness through an androgen mediated mechanism. For this experiment male rats from the SHR and SHR/y stains were crossed with female King-Holzman rats who carry the trait for testiclar feminization (Tfm) . The males from this cross were used because half of the males have normal androgen receptors (AR) and half of the males expressed deficent AR's. Renal NE samples were obtained from an isolated perfused kidney and measured by HPLC. After electrical stimulation, the NE levels were higher in normal AR hybrids than their AR deficient siblings. The SHR/y Tfm's showed a 58 % decrease in released NE when compared to their normal siblings. The SHR Tfm's when compared to their normal siblings released 5 % less NE. There seems to be a trend that shows the SHR Y chromosome influences renal NE responsiveness via an androgen mediated mechanism, (Supported by HL-48072-4).

2:30 INCREASED PLASMA NOREPINEPHRINE THROUGH SYMPATHETIC NERVE RELEASE IS DOSE RESPONSIVE TO CO_2. MIKE HERMAN, HAMID DANESHVAR, GAIL DUNPHY, DANIEL ELY, DEPT. OF BIOLOGY, UNIVERSITY OF AKRON, AKRON OH 44325-3908.

In our previous study on CO_2 response and plasma norepinephrine (NE) release, it was determined that the increase in NE after CO_2 exposure was not caused by adrenal medullary release, rather it was associated with sympathetic nerve system (SNS) release, and because N_2 produced similar results to CO_2, was mainly due to asphyxia. The objective of this study was to find out if there was a positive correlation between NE levels and increasing doses of CO_2. NE was measured by HPLC in normotensive Wistar-Kyoto rats and in male and female congenic strains with different Y chromosomes (our earlier study indicated there was neither a sex nor strain difference). We exposed each rat to 30 seconds of CO_2 using the following concentrations: 95% CO_2 and 5% O_2 the 1st week, 75% CO_2 and 25% O_2 the 2nd week, 50% CO_2 and 50% O_2 the 3rd week, 25% CO_2 and 75% O_2 the 4th week, 5% CO_2 and 95% O_2 the 5th week. The same rats were used throughout the experiment (n=10 per group). CO_2 increased NE levels seventeenfold for the 95% mixture, followed by increases of 8x, 6x, 4x, and 2x, respectively. In conclusion, the increase in NE after CO_2 was in fact associated with a specific dose response.

2:45 NEONATAL SYMPATHECTOMY DECREASES STORAGE AND RELEASE OF CATECHOLAMINES AND SYSTOLIC BLOOD PRESSURE IN SPONTANEOUSLY HYPERTENSIVE RATS (SHR). MICHAEL M. NEEKI, TONY LABABIDI, GAIL DUNPHY, DANIEL ELY, UNIVERSITY OF AKRON, DEPT. OF BIOLOGY, AKRON OH 44325-3908.

The objective of this study was to examine the effect of sympathectomy (SYMPX) on the development of hypertension and the time period during development when tissue norepinephrine (NE) may restore to normal. A total of 112 male one-day-old SHR pups were divided into four groups. Control groups CI (n=8) and CII (n=48) were injected with saline; SYMPX groups SI (n=8) and SII (n=48) were injected with a combination of anti-nerve growth factor and guanethidine from days 2-21. Systolic blood pressure (SBP), plasma testosterone (T), NE, and epinephrine (EP) were measured biweekly in-groups CI and SI from weeks 5-15. After the treatment period, 6 animals from each of the CII and SII groups were terminated weekly from weeks 3-15 and their hearts, testes, and kidneys were analyzed for catecholamines. The SYMPX groups showed a significant decrease in plasma NE (370 ± 59pg/ml, p<0.001), EP (110 ± 72pg/ml, p<0.001), T (1±0.2ng/ml, p<0.001), and SBP (27 ± 3.1mmHg, p<0.001) respectively, as compared to control groups. There was a significantly lower (90 ± 7%, p<0.001) organ concentration of NE in SYMPX animals each week from week 3-15 except week 5. In conclusion, SYMPX resulted in a significant decrease in storage and release of catecholamines in SHR rats. This decrease was observed from 3 to 15 weeks, paralleling the decrease in SBP and did not restore to normal. (Supported by HL #48072-4).

3:00 DIFFERENCES IN LIVER ANGIOTENSINOGEN mRNA AND BODY WEIGHTS AND THEIR ASSOCIATION TO AUTOSOMAL ORIGIN. JAMES V. TREACLE, DANIEL L. ELY, MONTE E. TURNER AND AMY MILSTED, DEPT. OF BIOLOGY, UNIVERSITY OF AKRON, AKRON OH 44325-3908.

Angiotensinogen is the liver glycoprotein substrate of the renin-angiotensin system. It is processed to angiotensin II, which produces elevated blood pressure. In some populations, the angiotensinogen gene has been found to cosegregate with elevated blood pressure, making it a candidate gene for hypertension. The first objective of this study was to evaluate differences in liver angiotensinogen mRNA and body weight among four rat strains, Wistar-Kyoto (WKY) a normotensive rat, the spontaneously hypertensive rat (SHR) and the two consomic strains, (SHR/a) with SHR autosomes with WKY Y chromosome and (SHR/y) with SHR Y chromosome with WKY autosomes. The second objective was to determine if there were any data similarities in strains having the same autosomes. Total cellular RNA was extracted from three week old male rats and analyzed by Northern blot, using radiolabelled rat angiotensinogen cDNA. At three weeks of age, liver angiotensinogen mRNA levels are significantly higher in SHR and SHR/a (.0557 ± .00326, .0500 ± .00379) than in WKY and SHR/y (.0117 ± .00726, .0273 ± .00574) (p<.05). Angiotensinogen mRNA and body weights are apparently regulated independently. Body weights of SHR, SHR/a, and SHR/y are significantly lower than normotensive WKY rats (p<.001). These results indicate that mRNA encoding liver angiotensinogen is expressed similarly in rat strains possessing the SHR autosomes with no apparent relationship to body weight differences.

SESSION 20

EXPERIMENTAL PHYSIOLOGY II

02:00PM SATURDAY, APRIL 4, 1998

JOHNSTON HALL 017

MARY D. GAHBAUER - PRESIDING

2:00 TESTOSTERONE AND RENAL FUNCTION IN THE DEVELOPMENT OF SPONTANEOUS HYPERTENSION. BEI LIU, RONALD SALISBURY, DANIEL ELY, DEPT. OF BIOLOGY, UNIVERSITY OF AKRON, AKRON OH 44325-3908.

It has been well documented that males have greater blood pressure, and are more sensitive to salt in terms of hypertension development. However, the precise mechanism by which testosterone exerts its effect is unclear. Since renal function is very important to salt metabolism and blood pressure regulation, we hypothesize that testosterone may be responsible for both the sexual dimorphism in salt-sensitivity and in the development of hypertension. This study was designed to examine the relationship between testosterone and Na+ excretion in the development of hypertension. Female SHRs (5-weeks, n=33) were divided into 5 groups: i) Two control groups, one on high Na=diet (8% NaCl, H-Na+Ctrl, n=8) and another on a normal Na+ diet (N-Na+ Ctrl, n=6); ii)Ovariectomized (OVX, n=6); iii) Testosterone implanted (Ti, n=6); iv)Ovariectomized + testosterone implanted (OVX+Ti, n=7). Systolic blood pressure (SBP) was measured weekly by the tail cuff method. Urine samples (24 hours) were collected at 8 and 15 weeks of age. Urinary sodium was determined by Na+ electrode. ANOVA showed that: 1) There were no differences between H-Na+ and N-Na+ Ctrl groups in SBP (138 ± 3 mmHg vs. 136 ± 7 mmHg); 2) SBP in testosterone treated groups, Ti and OVX-Ti, reached 156 ± 6 mmHg and 202 ± 16 mmHg, respectively, and was significantly different compared to both control groups (p<0.0001); 3)All T treated groups showed significantly less 24 hour water (p<0.0001) and Na+ excretion (p<0.01) compared to that of Ctrl. 4) The OVX group showed less urine volume and Na+excretion when compared to that of Hi-Na+ Ctrl. Therefore, we conclude that T may act through androgen receptors to increase Na+ reabsorption and enhance the development of hypertension (supported by HL-48072-4).

2:15 NEUROENDOCRINE EFFECTS OF ORPHANIN FQ ADMINISTRATION IN RATS WINNIFRED M. BRYANT, MICHAEL BAUMANN,PHYLLIS CALLAHAN AND JAMES M. JANIK, DEPT OF ZOOLOGY, CTR. FOR NEUROSCIENCE, MIAMI UNIVERSITY, OXFORD OH 45056.

The endocrine effects of Orphanin FQ (OFQ), a recently identified neuropeptide which resembles the endogenous opioid, dynorphin, were determined. A dose response study was performed on male and female Sprague-Dawley rats which were implanted with chronic intracerebroventricular (icv) and intravenous cannula. On the day of the experiment, an inital blood sample was withdrawn followed immediately by an injection of saline or OFQ (0.01, 0.1, 1.0, 10.0 µg; 5 µl, icv). Additional blood samples were withdrawn 10, 20, 30, and 60 minutes after administration of treatment. Blood samples were centrifuged and the plasma collected and stored frozen (-20°C). Concentrations of Prolactin (PRL), Growth Hormone (GH), and Corticosterone

(CORT) were determined in blood plasma by radioimmunoassay. OFQ significantly increased GH secretion in male, but not in female rats. In males, the highest dose of OFQ did not increase GH levels, even though lower doses stimulated GH secretion. OFQ significantly increased PRL secretion in both male and female rats in a dose related manner, but the magnitude and duration of the increase was greater in female rats. Lower doses of OFQ increased CORT levels in male rats.

2:30 TESTOSTERONE ENHANCES BLOOD PRESSURE AND CARDIOVASCULAR PATHOLOGY IN THE PRESENCE OF HYDRALAZINE IN GENETICALLY HYPERTENSIVE RATS. **Darcie Smith, Gail Dunphy and Daniel Ely, Dept. of Biology, University of Akron, Akron OH 44325-3908.**

Testosterone (T) has been implicated in the development of hypertension in the spontaneoulsy hypertensive rat (SHR). Increased blood pressure (BP) and T have also been postitively correlated with increased cardiovascular (CV) pathology. Therefore, the objective of this study was to test the hypothesis that T raises BP by a mechanism other than vasoconstriction and causes increased CV pathology. Forty four-week-old SHR males were randomly placed into 4 treatment groups (n=10); controls, castrates, hydralazine (HYZ) treatment (80mg/L drinking water), and castrate and HYZ treatment. Tail cuff BPs were measured bi-weekly from 6 to 21 weeks of age and blood was collected for catecholamine (HPLC) and T (RIA) analysis. At 10 weeks of age the BP of both HYZ groups and the castrate+HYZ group were significantly lower than that of the controls (157 mmHg, 153 mmHg, and 173 mmHg respectively, $p<0.05$). At 12 weeks of age the castrate+HYZ group was split into 2 groups each with the same mean BP (162 mmHg). One group was implanted with T-implants, however each group remained on HYZ. The BP of the T-implant group significantly increased over that of the non-implant group (191 mmHg vs. 168 mmHg, $p<0.05$) while significantly lower than controls (208 mmHg, $p<0.02$). Castration significantly reduced kidney and coronary artery pathology, HYZ significantly reduced kidney pathology and testosterone in the presence of HYZ significantly increased kidney and coronary artery pathology. In conclusion, T appears to increase BP, renal, and heart pathology by a means other than vasoconstriction (Supported by HL 48072-4).

2:45 GLUCOCORTICOIDS REGULATE BRAIN PROTEIN SYNTHESIS IN A STIMULUS-DEPENDENT MANNER. **Linda A. Dokas and Christina S. Barr, Dept. of Medicine, Medical College of Ohio, Toledo OH 43614-5809.**

Glucocorticoid (GC) hormones, acutely released from the adrenal cortex, mediate pleiotropic responses to stress by regulating gene expression. However, chronic exposure to GC hormones is maladaptive. Elevation of GC levels by chronic stress or aging sensitizes neurons in the hippocampus, a brain region containing a large population of GC receptors, to adverse stimuli, a phenomenon termed "endangerment". To test whether the endangered state correlates with alteration of protein synthesis, rats were injected with GC hormones after which brain slices were incubated with [^{35}S]-labeled amino acids. Prior GC hormone administration increased hippocampal synthesis at 37 °C of glycerol phosphate dehydrogenase, an enzyme which may be involved in maintenance of osmotic balance in the brain. When hippocampal slices were incubated at 39 °C, a heat-shock pattern of protein synthesis was observed and GC hormone treatment decreased synthesis of unidentified 25 and 47 kDa proteins. In cerebellar, but not hippocampal, slices, heat shock increased synthesis of the small heat shock protein, hsp27. Slice incubation under ischemic conditions produced a third pattern of GC hormone-sensitive protein synthesis: 60 kDa (pp60$^{c\text{-}src}$) and 78 kDa hippocampal proteins were decreased. These results, demonstrating that GC hormones regulate brain protein synthesis in a stimulus-dependent manner, suggest that hippocampal endangerment correlates with a lack of adaptive protein synthesis after adverse stimuli.

3:00 STEROID SULFATASE INHIBITOR DECREASES BLOOD PRESSURE AND ALTERS STEROID PROFILES IN SHR, SHR/a, SHR/y AND WKY RATS. **Shawna D. Valigora, Pui-Kay Li*, Monte Turner, Daniel Ely, Dept. of Biology, University of Akron, Akron OH 44325-3908. *(Duquesne University, Pittsburgh).**

Our hypothesis is that steroid sulfatase (STS) may contribute to the development of hypertension. Steroid sulfatase is known to catalyze the conversion of steroid, cholesterol and glucocorticoid sulfates to their nonconjugated forms. This active form causes the elevation of steroids, which may lead to increased blood pressure (B.P.). Eight rats of each strain were injected with estrone (control group), which is the chemical backbone of the STS inhibitor, and eight were given the STS inhibitor, twice a week. B.P. was taken weekly by tail cuff. Serum testosterone (T), estrogen (E_2), and plasma corticosterone (C) levels were measured by RIA. At the end of ten weeks the body weights of the STS inhibitor rats were 12% less than those given estrone. The average differences between the systolic B.P. of the estrone control rats and the STS inhibitor rats, respectively, for all four strains were (SHR=8 mmHg), (SHR/a=14 mmHg), (SHR/y=11 mmHg), and (WKY=5 mmHg). Significance in B.P. was found in the SHR/a and WKY rats. The heart weights in the STS inhibitor groups were 14% lower than the estrone groups and the kidney weights were lowered 9%. However, the adrenals were increased 16% and the testes were increased 9% in the STS inhibitor group as compared to the controls. Plasma T and C decreased while E_2 increased in most strains after STS inhibition. In conclusion, the newly synthesized STS inhibitor significantly lowered B.P. which may have important implications for hypertension etiology and treatment. (Supported by HL 48072-4).

3:15 NOREPINEPHRINE CONTENT AND TURNOVER IN HEART AND KIDNEY OF SPONTANEOUSLY HYPERTENSIVE (SHR) AND NORMOTENSIVE RATS. **Ann Caplea, Gail Dunphy, Darcie Smith and Daniel Ely, Dept. of Biology, University of Akron, Akron OH 44325**

Recently our laboratory has reported that the SHR has a genetic component that increases sympathetic nervous system (SNS) activity that may be responsible for elevated blood pressure (BP). Blockade of the SNS during the neonatal period normalized BP. The objective of the following study was to determine if norepinephrine (NE) content and turnover which are an indicators of SNS activity in heart and kidney were elevated due to the SHR genetic component. Female adult WKY and SHR rats (10-12/group) were analyzed for NE turnover in heart and kidney. Tissues were harvested after 0, 1.5 and 3 hours of methyl-L-p tyrosine injection (250 mg/kg, i.p.) and stored at -70 C and assayed for NE by HPLC with electrochemical detection. The SHR hearts and kidneys showed a marked significant elevation in NE content (100% and 50%, respectively) compared to WKY however, the turnover rate in the females was not different between SHR and WKY. In conclusion, the SHR genetic component did not alter NE turnover in heart and kidney but did increased NE content which suggests that the SNS produces more NE which can increase blood pressure and promote tissue pathology (Supported by HL-48072-4).

3:30 ANALYSIS OF HUMAN HIPPOCAMPAL DEPTH EEG ACTIVITIES DURING SLEEP USING FOURIER TRANSFORM METHODS. **Yong S. Choi, Michael J. Dennis, James B. Farison*, and Mark Rayport, Medical College of Ohio and *University of Toledo, Toledo OH 43614-5807.**

The EEG activity of the hippocampus is of particular interest due to this structures crucial role in the formation of memories. Animal studies show a distinct rhythmic theta activity while awake and during REM sleep, which is not visually seen in human data. Frequency analysis may enabled the evaluation of frequency activity differences not notable through visual analysis. Multichannel electroencephalographic (EEG) data were obtained on three patients with intractable epilepsy during presurgical evaluation. A total of 53 hours of data sampled at 200 samples per second were recorded from multiple depth electrodes stereotactically placed in the hippocampus. Fast Fourier Transform frequency analysis was used to provide frequency spectra and to catagorize the signal into the traditional delta (<4Hz), theta (4-8Hz), alpha (8-12Hz), sigma(12-16Hz), and beta (16-20Hz) frequency bands. The relative amplitudes in these bands were compared and analyzed during REM, and non-REM sleep. Periodic brief episodes of sigma rhythmic activity are seen in both REM and non-REM sleep with good consistency in the frequency spectra. Nearby hippocampal electrodes exhibit similar low frequency patterns and subtraction of frequency spectra from an anterior electrode demonstrates a strong presence of localized theta activity in the vicinity of the posterior electrode.

SESSION 21

Gestational & Neonatal Development

09:00AM Saturday, April 4, 1998

Johnston Hall 017

Lee A. Meserve - Presiding

9:00 THE ROLE OF ESTROGEN IN ZEBRAFISH (*DANIO RERIO*) NEURODEVELOPMENT. **Alison M. Aldrich, PO Box 639, Hiram, OH 44234.**

Teleost fish exhibit high levels of aromatase (estrogen synthetase) coupled with estrogen receptors in the brain. Environmental estrogens disrupt the endocrine systems of fish and other organisms, leading to abnormalities in reproductive system development. We hypothesize that estrogen also plays a key role in nervous system development, and that exposure to environmental estrogen during embryogenesis can lead to neurodevelopmental defects. Zebrafish (*Danio rerio*) embryos were exposed to different concentrations of estrogen and/or estrogen blocking substances in the rearing water for the first five days of development. Mortality, time-to-hatching, and abnormal characteristics were recorded. Results indicate a possible connection to a previously identified genetic mutant, which has a curved tail, impaired circulation, and defective retinotectal pathfinding.

9:15 THE EFFECTS OF CASTRATION ON BLOOD PRESSURE AND BODY WEIGHT: RELATIONSHIP TO THE HYPERTENSIVE Y CHROMOSOME. **Thomas J. Pesarchick and Amy Milsted, Dept. of Biology, University of Akron, Akron OH 44325-3098.**

The development of hypertension has been shown to be influenced by the presence of androgens. The objective of this study was to investigate whether removal of androgens reveals any Y chromosome effects on body weight (BW) and blood pressure (BP). Rats used were the hypertensive SHR, a normotensive WKY and 2 consomic strains SHR/a and SHR/y. Each strain was divided into two groups, control (n=20) and castrated (n=20). At three weeks of age, rats in the control groups were sham operated and rats in the castrated group had their testes removed. BWs were taken and BP were measured by tail cuff sphygmomanometry for one week before termination at 10 weeks of age. At termination, blood and tissue samples were collected and frozen at -70C for future molecular analysis. Two way ANOVA showed BW of castrated rats was significantly lower than the control animals ($p<.05$) in all strains. BW differed between groups and strains, with BW of WKY rats significantly lower than SHR, SHR/a, and SHR/y ($p<.05$). Castration decreased BP in all strains, compared to the controls [SHR, 16.9%; WKY, 20.1%; SHR/a, 14.9%; SHR/y, 6.3%; ($p<.05$)]. These results indicate that castration effects on BW and BP are not affected by the hypertensive locus on the SHR Y chromosome during this developmental period. Our results further confirm the requirement for testosterone for development of normal BW and BP in the rat.

9:30 GESTATIONAL EXPOSURE TO 250 PPM POLYCHLORINATED BIPHENYL RESULTS IN COMPLETE PUP MORTALITY. Beth B. Pritts and Lee A. Meserve. Dept. of Biology, Le Moyne College, Syracuse, NY 13214 and Dept. of Biological Sciences, Bowling Green State University, Bowling Green OH 43403.

Previous work studied the effects of dietary administration of the environmental toxin polychlorinated biphenyls (PCB) at 250 ppm on thyroid hormone status and neurologic function in 15 or 60 day old rats. In 15 day old animals, choline acetyltransferase activity was significantly depressed compared to controls but by 60 days of age there was no significant difference from controls. Thus, the present study was performed to determine at what age between 15 and 60 days the enzymatic activity returned to that of controls. Adult female Sprague-Dawley rats were given standard ground rodent chow plain or containing 250 ppm PCB (Aroclor 1254®) from the time of conception. PCB cross the placenta so developing rats are exposed from the time of conception and via the breast milk prior to weaning. The gestational period of these animals was unremarkable, yet all PCB-exposed pups died by 18 days of age. This result was not anticipated. Gas chromatographic analysis of PCB used in both studies indicated no difference between the two. Living conditions were the same in both studies. Necropsies of some animals revealed gross abnormalities of abdominal cavity organs and fluid accumulation. There had been a change in the stock of the rat colony at the institution. A report in the literature indicated rodent strains have different levels of sensitivity to environmental toxins. The present study suggests that variations in sensitivity among colonies of the same strain may exist as well. Similar studies were successfully completed using 125 ppm or less PCB exposure.

9:45 EFFECTS OF NEONATAL DIHYDROTESTOSTERONE (DHT) ON BLOOD PRESSURE AND BEHAVIOR IN ADULT FEMALE SPONTANEOUSLY HYPERTENSIVE RATS (SHR). Lisa A. Hogue, Ron Salisbury and Daniel Ely. Department of Biology, University of Akron, Akron OH 44325-3908.

Across most mammalian species, males have a higher blood pressure (BP) than females as adults. Estrogen is thought to be a protector and testosterone (T) a promoter of high BP. The objective of this study was to see if neonatal injections of DHT would raise BP and alter behavior in female rats. Therefore, injections of 5α-dihydrotestosterone benzoate (5α-DHT-B) were given to female pups on day 3 after birth to masculinize the CNS and study the relationship on BP. The critical period for masculinization of the brain is completed 5 days after birth. DHT was used instead of T since T is converted to estrogen and DHT is not. On day 3 postpartum, half of the SHR female pups were given injections of 50 μg per 100 g of body weight of DHT (n=10) and the rest (n=10), including males (n=10) were given the vehicle (oil). The pups were weaned at 21 days of age and were approximately 6 weeks old before BP (tail cuff) measurements were made for 16 weeks. Open field behaviors were studied between the two female groups at 17 weeks. The BP, catecholamines (taken retrorbitally), and open field behavior of the two female groups were measured. No significance was found in the catecholamine or estrogen levels between treatments. BP was significantly higher ($p<0.05$) in the DHT groups compared to controls at weeks 10, 14, and 16, respectively (133 vs. 119 mmHg, 145 vs. 126 mmHg and 139 vs. 126 mmHg). Behavior observations showed that crossings, rearups and groomings were not significantly different between treatments. It is concluded that neonatal injections of DHT cause changes in BP but not in catecholamine or estrogen levels and behaviors (Supported by HL# 48072-04).

10:00 DOSE- AND AGE-DEPENDENT ALTERATIONS OF CHOLINE ACETYLTRANSFERASE (CHAT) ACTIVITY, THYROID STATUS, AND LEARNING AND MEMORY IN 15- AND 30 DAY OLD RATS EXPOSED TO 1.25 AND 12.5 PPM POLYCHLORINATED BIPHENYL FROM CONCEPTION. T. Provost, L.M. Juárez de Ku, C. Zender, and L.A. Meserve, Dept. of Biological Sciences, Bowling Green State University, Bowling Green OH 43403-0212.

Polychlorinated biphenyls (PCB) are ubiquitous environmental contaminants. Ingestion of large concentrations of PCB mixtures has caused depressed thyroid status, epidermal abnormalities, and learning and memory deficits in experimental animals and humans. The present study extended preliminary findings that small concentrations of dietary PCB alter choline acetyltransferase activity in the hippocampus and basal forebrain, as well as behavioral measures, perhaps as a result of altered thyroid status. Fifteen- and 30-day old rats were exposed from conception to the end of experiment to either 1.25 ppm or 12.5 ppm Aroclor 1254® in the maternal diet. At 15- and 30-days of age, activity of ChAT was determined radiometrically in hippocampus and basal forebrain, and thyroid hormone status was determined with commercially available RIA kits. Learning measures were made in a Morris water maze over 10 trials between 25 and 29 days of age. Fifteen-day old 1.25 ppm animals had significantly elevated ChAT activity in the two brain areas as compared to same age controls and 12.5 ppm animals. This ChAT elevation correlated with elevated thyroid hormone concentrations. Activity of ChAT displayed a trend toward depression in 15-day old 1.25 ppm rats, and was significantly depressed at 30 days regardless of PCB dose. Learning and memory of the Morris water maze was depressed by 12.5 ppm PCB. These results extend our previous findings that ChAT activity and behavior are altered by PCB, perhaps as a direct effect of thyroid status. These alterations are dependent on the length of time of exposure and the amount of PCB ingested.

10:15 THE EFFECTS OF NEONATAL SYMPATHECTOMY ON BLOOD PRESSURE AND CARDIOVASCULAR PATHOLOGY IN NORMOTENSIVE AND BORDERLINE HYPERTENSIVE RATS. Gail Dunphy, Dave Wiley, Darcie Smith, and Daniel Ely, Dept. of Biology, University of Akron, Akron OH 44325-3908.

Previously we have reported increased sympathetic activity (SA) indices in the SHR/y (the consomic of the Wistar Kyoto (WKY) normotensive rat with a hypertensive Y chromosome from the spontaneously hypertensive rat (SHR)). Increased SA is a large component in the development of hypertension in SHR and in some forms of human hypertension. The objective of this study was to determine if neonatal sympathectomy (sympx) reduces adult blood pressure (BP) and cardiovascular pathology. Guanethidine (GD) a sympathoplegic drug, and an antibody to nerve growth factor (anti-NGF) were administered to WKY (n=20) and SHR/y (n=19) male rats the first three weeks of life to decrease SA. WKY (n=20) and SHR/y (n=18) control groups were administered saline for three weeks. BP was measured by the tail cuff method, and tissue norepinephrine (NE) by HPLC. Kidney and hearts were stained with Sirius red and scored for pathological changes. Sympx significantly reduced BP in the SHR/y and WKY rats as compared to controls at week 15 ($p<0.01$) and significantly reduced tissue NE levels and myocardial and coronary collagen and renal glomerular damage in SHR/y. In conclusion, the SA and the SHR Y chromsome in borderline hypertensive rats promotes increased BP and heart and renal damage (Supported by HL-48072-4).

10:30 STEROID SULFATASE LEVELS ARE A SECONDARY RESPONSE TO INCREASED BLOOD PRESSURE. Vicky Snyder, Daniel Ely, Monte Turner, University of Akron, Dept. Biology, Akron OH 44325.

The objective of this study was to examine the effects of tissue steroid sulfatase (STS) levels when BP is lowered at an early age. If STS activities are a secondary effect of increased BP, there should be a significant linear regression of BP vs. STS in the control animals and the hydalazine treatment should reduce levels in all strains comparable to the reduction of BP. A 4 x 3 factorial design was used in which males from all 4 strains were randomly assigned to 3 treatment groups (hydralazine 80μg/Kg added to drinking water, castration at 4 weeks, and control). BP, measured by tail cuff technique, was alternated weekly with retro-orbital blood draws from which testosterone levels were analyzed. At 8 wk., BP demonstrated strain differences in which castrate and hydralazine groups BP were reduced (SHR by 25 mmHg; SHR/a by 18 mmHg; and SHR/y by 10 mmHg) compared to control groups of each strain. WKY were all in the +normotensive range. Hydralazine treatment showed a strain significant difference for serum testosterone levels (ng/ml): WKY vs. SHR ($p< .001$) and SHR vs. SHR/a ($p< .01$). At 12 weeks, animals were sacrificed and heart, kidney, testes, adrenal glands, and liver were assayed for STS levels. Hydralazine produced strain and tissue specific changes in STS levels. In conclusion, these results support the hypothesis that a Y chromosome affects BP and the BP regulates STS levels which can accelerate hypertension. (supported by HL - 48072 - 4).

10:45 THE EFFECTS OF HYDROSTATIC VS. ENDOCRINE FACTORS ON CARDIOVASCULAR AND RENAL PATHOLOGY IN SPONTANEOUSLY HYPERTENSIVE RATS (SHR) Changying Li, Darcie Smith, Daniel L. Ely. Department of Biology, The University of Akron, Akron OH 44325-3908.

Hypertension can cause pathological changes in the cardiovascular and renal systems, such as increased myocardial fibrosis, coronary collagen deposition and renal glomerular degradation. The objective of this study was to examine the relationship between the direct effects of blood pressure vs. endocrine factors upon cardiovascular pathology in SHR male rats. Spontaneously hypertensive male rats (SHR) bred at The University of Akron were studied from 5 to 15 weeks of age. There were 10 SHR male rats in each of three groups: controls, colony-stress and colony-stress-hydralazine-treated. Colony-stress was created with 10 SHR male and 10 SHR female rats in one colony box (441). The colony-stress- hydralazine-treated group was set up the same as the colony-stress group except hydralazine (vasodilater) was administered in the drinking water (80mg/l). Systolic blood pressure (Sbp) was measured by tail-cuff sphygmomaometry every other week from 5 to 15 weeks of age. Blood samples were obtained by retro-orbital technique for norepinephrine (NE) by HPLC, testosterone (T) and angiotensin II (AngII) by RIA in alternate weeks of Sbp measurement. Body weight gains were not significantly different between groups. The Sbp of the colony-stress group reached 160mmHg at 16 weeks of age, the control group was 153mmHg and the hydralazine-treated group was 135mmHg. There was a statistically significant difference ($P<0.0001$) between three groups. T and NE and AngII were not affected by hydralazine treatment but NE and AngII were elevated by stress. Heart and renal pathology were elevated by stress but not completely normalized by hydralazine (Supported by HL-48072-4).

SOCIAL & BEHAVIORAL SCIENCES DIVISION

SESSION 22

Social & Behavioral Science

09:00AM Saturday, April 4, 1998

Johnston Hall 203

Alinde J. Moore - Presiding

9:00 PUSHING THE PARAMETERS: CONSIDERATIONS IN SELECTING A SAMPLE IN AN OLDER POPULATION. Alinde J. Moore and Dorothy C. Stratton, Dept. of Psychology, Ashland, University, Ashland OH 44805.

The setting and testing of population parameters in a qualitative research project entitled "Resilience in Elderly Widowers," is examined. The project is based on the "grounded theory" approach devised by Glaser and Strauss (1967) wherein theory is developed on the basis of early

interviews and is refined and elaborated upon as additional interviews are conducted. In this study, the age parameter of 60 was chosen to define the population of older men as those whose child rearing responsibilities had ended by the time of the wife's death and whose careers were at or nearly at retirement. The time limits since death of spouse (3 to 6 years) were set to avoid men in active bereavement who would not have had time to demonstrate adjustment to the loss and to maximize the likelihood that they would have clear detailed memories of their wives. When early referrals led to men just outside the parameters, interviews were conducted to see what they could contribute to the study and to determine if there were valid reasons to expand the original parameters of the study. Findings demonstrate the limitations of age parameters, the unique contributions of each case and the evolving nature of qualitative study.

9:15 THE RELATIONSHIP OF PERSONALITY CHARACTERISTICS AND ALCOHOL USE AMONG A COLLEGE POPULATION **Sara J. Crawford 2218 Chalmette Dr. Toledo OH 43611.**

The question of what causes some individuals to consume alcohol more frequently and in greater quantities than others is very popular among college campuses. Certain personality traits in individuals often correlate with alcohol use, these specific traits are greatly unknown. Personality traits, as measured by the Sixteen Personality Factor Questionnaire, are compared to data gathered via the Core Instrument. Hypotheses determined that athletic participation and the traits labeled superego/control, anxiety, independence, and tough-poise positively correlate with alcohol use. The sample consist of 100 subjects, 41 males and 59 females. A multivariate analysis of variance is used to determine between and within group differences among the variables. A discriminate analysis is utilized to determine which dependent variables differentiate between high and low alcohol use scores. Results show that athletic participation does not correlate with alcohol use. The named personality characteristics do correlate with alcohol use. The findings of this study provide direction for which students should be targeted for prevention and intervention efforts on campuses.

9:30 ASSESSMENT OF NURSES RESPONSES TO THE INTRODUCTION OF A NEW COMPUTER SYSTEM. **Marianela E. Zytkowski (Elizabeth Madigan; Christine Hudak), Glaser 310B 11900 Carlton Rd. Cleveland OH 44106.**

The trend for health care is moving towards improving patient care by using information systems (IS) as a resource in data collection. Hospitals are upgrading their systems to meet the needs of these demanding trends. Assessment of the users of these systems is necessary to predict the impact these new systems will have on health care. Nurses have traditionally been the center of patient care and data collection for patient records. The purpose of this study was to determine the factors which played a role in nursing responses to change when a new information system is implemented. Three factors are hypothesized to determine nursing responses to this change: nurses past experience with computers, response to training classes on the new system, and overall satisfaction with the system. We hypothesized: More positive attitudes to an IS will be found in: 1. Nurses who are more comfortable with computers; 2. Nurses who felt the training classes were helpful; 3. Nurses who are more satisfied with the IS. The study is being done in a large Midwestern teaching hospital. Data are being collected in a variety of nursing units via a questionnaire using a Likert scale with 15 questions; five on each of the three aspects. Once hospitals understand how nurses respond to the change of a new computer system, and the factors that influence that change they will more capable of preparing for these responses. The feedback that hospitals receive from these surveys can gear the future of computer implementation and the effects on its users.

9:45 CONSERVATION AND CULTURAL SURVIVAL IN THE BRAZILIAN RAINFOREST: THE WAIMIRI ATROARI INDIAN PROJECT. **Sharon E. Dean, Associate Curator; Peggy S. Ratcheson, Ph.D., Assistant Curator. The Cleveland Museum of Natural History, Dept. of Cultural Anthropology, 1 Wade Oval, University Circle, Cleveland OH 44106.**

The Waimiri Atroari tribe occupies a 2 million hectare reservation approximately 170 kilometers north of Manaus, Brazil. Rich in mineral resources, tribal land has been expropriated by the Brazilian government and private companies over the past 30 years for various engineering projects. Ensuing disease, starvation, forced labor, and armed skirmishes reduced the Indian population by 92% and destroyed the tribe's social organization. To help mitigate the socio-environmental impact of these adverse projects, the Waimiri Atroari Program was created in 1988. Funded by a 25-year subsidy from the Brazilian government, the Program focused on health and dental care, education, support for farming activities, the resurrection of cultural traditions, and strict territorial surveillance. As a result, living standards and conditions for tribal members have improved greatly: the population has doubled, the literacy rate is up, and the mortality rate is down. Concomitantly, water pollution has decreased, soil and vegetation has been preserved, and the number of botanical species in the area has increased. The achievements of the Waimiri Atroari Project, therefore, eloquently illustrate the advantages of indigenous input into ecosystem preservation.

10:00 SPECIES DIVERSITY AND HUMAN OCCUPATION AT LATE PLEISTOCENE CAVE SITES IN THE MIDWEST. **Carol S. Landefeld, 4066 Oak Hill Rd., Peninsula OH 44264.**

One of the important issues in our understanding of Early Paleoindian livelihood in Eastern North America is the question of subsistence patterns, including the foods they ate and how they acquired them. Other researchers have noted an increase in species diversity during human occupation. This paper compares the faunal assemblages at cave sites identified using FAUNMAP, with Sheriden Cave in Wyandot County to identify such a relationship if it exists. Sheriden Cave contains Pleistocene vertebrate fauna with an artifact assemblage in stratigraphy with radiocarbon dates of 10,850 ∓ 60 b.p. and 10,680 ∓ 80 b.p. (uncalibrated radiocarbon years b.p.).

10:15 *ILLUSTRATIONS OF THE NESTS AND EGGS OF THE BIRDS OF OHIO*: A FAMILY'S SEVEN YEAR QUEST TO BRING A SCIENTIFIC WORK TO COMPLETION. **Joy M. Kiser, Cleveland Museum of Natural History, 1 Wade Oval Dr., University Circle, Cleveland OH 44106.**

Although *Illustrations of the Nests and Eggs of the Birds of Ohio* was described as the "most beautiful" book on a natural history subject ever created in America and was valued not only for the artist excellence of the plates but for their scientific accuracy as well, its creators were neither formally trained scientists or artists and they never recouped the lifetime's worth of savings they invested in its publication. Today the work is highly prized and commands a formidable sales price. The audience will learn the remarkable details of the obstacles encountered and overcome by the Howard Jones family of Circleville Ohio, who persevered and devoted their entire lives to the production of and marketing of this little known work. *Illustrations of the Nests and Eggs of the Birds of Ohio* should be celebrated as a monument to an exceptional Ohio family, to the early American passion for scientific inquiry, and to the fine publishing standards established by the Adolph K. Kreb's Lithographic Co. and the Robert Clarke Publishing Co. of Cincinnati.

PRE-COLLEGE STUDENTS ALL FIELDS OF INTEREST

SESSION 23

Pre-college Morning

09:00AM Saturday, April 4, 1998

Johnston Hall 201

Nicholas J. Douville - Presiding

9:00 THE EFFECTS OF GENDER AND RAT STRAIN ON HEART FUNCTION. **Szilvia Nagy, Vicky Snyder, Daniel Ely, Dept. Biology, Univ. of Akron, Akron OH 44325.**

The objective of this study was to examine the effects of gender and rat strain on heart function. Hypertension is a polygenic disease for which genetically hypertensive rats are the favored model of study. Previous studies have indicated that there are two genetic components effect that hypertension in the SHR rat. One is autosomal and the other is Y-linked. Left ventricular pressure generated between genetically different rats will show a linear regression from highest of SHR/y to SHR/a to feminized mates without androgen receptors. The two consomic hybrid strains, SHR/a and SHR/y were obtained by genetic crosses between SHR and WKY rats. SHR/a has SHR autosomes and a WKY Y-chromosome, while an SHR/y has WKY autosomes and an SHR Y-chromosome. Testosterone feminized male (TFM) rats are deficient in androgen receptors, a trait that is X-linked. The rat hearts were quickly excised, weighed, and isolated. The hearts were perfused with Krebs-Henseleit perfusate bubbled with 95% O_2 / 5% CO_2 using the Langendorff technique. Left ventricular systolic and diastolic pressures were obtained. The systolic and diastolic pressures of SHR/y rats were highest, followed by SHR/a and TFM. In conclusion, it appears that the SHR Y-chromosome influences left ventricular pressure and that functional androgen receptors faciliitate left ventricular function.

9:15 IDENTIFYING ESTROGEN RECEPTOR NEURONAL PROJECTIONS TO THE A15 REGION IN SHEEP. **Kristen E. Humbach, 2898 Shaffer Ave., Cincinnati, OH 45211.**

The dopeminergic neurons in the A15 region of the sheep brain, although lacking estradiol receptors (ER), were hypothesized to channel the negative feedback effects of estradiol. To identify the source(s) of ER-containing neuronal input to the A15 region a combination of neural tract-tracing immunocytochemical procedures were used. The tract tracing compound CTBIs cytoplasmic antigens, and ER's nuclear antigens were both visualized using a dual-immunoperoxidase procedure. Initially the tissue labeled non-specifically. Procedures were performed to determine if this resulted from: 1)degradation of the ER antibody, 2) previous exposure of the ewes to rodent antigen protein(s) to produce anti-mouse immunoglobulins capable of binding to any mouse antibody, or 3) tissue-specific problems. It is concluded that the strength of the fixative used for perfusing was too great and that subsequent post-fixation for an undetermined length of time prevented sufficient antibody penetration.

9:30 STEROID SULFATASE LEVELS ARE INFLUENCED BY BLOOD PRESSURE LEVEL **Amina A. El-Sharkawy, Daniel Ely, Gail Dunphy, Monte Turner. Dept. of Biology, Univ. of Akron, Akron, OH 44325.**

The objective of this study was to examine the effects of tissue steroid sulfatase (STS) levels when BP is lowered by hydralazine. STS is known to catalyze the conversion of steroid, cholesterol, and glucocorticoid sulfates to their nonconjugated forms. This active form leads to the elevation of steroids in the animal, which can lead to increased blood pressure. If the Y chromosome regulates STS levels, then hydralazine treatment will not reduce STS levels. Forty adult male rats (8-10 from each strain of SHR, SHR/a, SHR/y, and WKY) were used. Half from

each strain were given hydralazine treatment. Tail BP by sphygmomanometry was alternated with retro orbital blood samples each week. All animals were sacrificed after 28-32 weeks, and the heart, left kidney, adrenal glands, and a section of the liver were assayed for protein and STS levels. ANOVA results ($p = 0.095$), found that lowered blood pressure had an effect on the amount of STS, but hydralazine did not alter testosterone levels in any strain. In conclusion these results, which are strain and tissure specific, support the hypothesis that a Y chromosome affects BP and the BP regulates STS levels which can accelerate hypertension. (Supported by HL-48072-4).

9:45 WHAT ARE THE EFFECTS OF RIGHT-LEFT BRAIN DOMINANCE ON SHORT TERM MEMORY AND LEARNING STYLES? **John James Keller 6431 Highlawn Drive Columbus OH 43229.**

The dominant hemisphere in the brain develops sometime between the age of five and puberty. The purpose of the study is to determine the effects of short term memory learning styles in students who are right brain dominant (creative) verses students who are left brain (logical) dominant. From a review of pertinent literature, a hypothesis was formed that the test group will be more left-brain dominant. Fifty students between the ages of 11 and 15 participated in the study. Each subject was secluded from the group during the testing. Each subject completed a HCP (Hemispheric Consensus Prediction) survey then were introduced to short term memory test words. Subjects were given a timed right I left brain dominance test then asked to recall the memory test words. The results of the study indicated most subjects exhibited left brain dominance. Learning styles observed from the left brain dominate group were as Kolb's Postulate (1973) described—reflective observation or Type II, which was reinforced by the test times recorded. Results also indicated that subjects with the most accuracy and the shortest recall times were the right brain dominate types.

10:00 SINGLE AND CO-INFECTION OF TEMPERATURE SENSITIVE MOUSE HEPATITIS VIRUS MUTANTS FOR THE PURPOSE OF MEASURING COMPLEMENTATION, RECOMBINATION, AND REVERSION PROCESSES. **Shannon Lee Marie Bowdren, 827 Fox Valley Ct., Cincinnati OH 45230.**

The need to understand sub-gnomic levels of the cell led to this study of viruses to observe different aspects of viral mutations. The following viruses were selected from the Mouse Hepatitis Virus Temperature-Sensitive (MHV/TS) Mutants: Albany 22 (Abl22), LA 6 (La6), and Albany 16 (Alb16). All analyses were conducted on BALB/c Mouse Seventeen Clone One (17cl-1) cells. A complementation experiment between La6 and Alb16 was conducted in triplicate at 40°C at 10% CO_2 to generate samples which were harvested at 2 and 9 hours post infection (p.i.). The samples were then titered at dilutions between 1:1 to 10-4. A second complementation experiment with Alb22, Alb16 and La6, titered samples with dilutions between 1:1 and 10-5. The titering of the individual viruses (based on growth curve analyses of Alb59-MHV) was performed at 37°C at 7.5% CO_2 from the original samples. Finally, a recombination experiment between La6, Alb16, and Alb22 was conducted in duplicate at 24hr. (p.i.). Samples were stored at -800C, rapidly thawed, and centrifuged for clarifying before titering at 37°C at 7.5% CO_2. They were then titered again at both permissive and non-permissive temperatures of 30°C and 39.5°C, respectively. From these studies it was established that the mutants Alb16 and La6 did not complement, that the complementation between Alb22 and La6 showed the highest complementation and that Alb22 and Alb16 showed questionable complementation. The recombination study indicated that the recombination frequency between Alb22 and Alb16 was the highest. Alb22 and La6 obtained the next highest recombination frequency. Alb16 and La6 showed no recombination. Based on these findings, limited mapping of where the mutants lie in relation to one another at the sub-genomic level can be suggested. Further studies are warranted to analyze the processes of complementation, recombination, and reversion to understand more about viral replication and viral gene mutations for the ultimate purpose of controlling viruses.

10:15 THE EFFECTS OF AN ENRICHED ENVIRONMENT ON MICE. **Philip R. Bauschard, 5211 SR 664 N., Logan OH 43138-9345.**

The purpose of this experiment was to link the learning process with environment. It was hypothesized that mice will learn at a faster rate when stimulated by their environment. Five mice were introduced to an enriched environment, a plastic cage with platforms, tunnels, and toys, at an age of two weeks. Another five mice were placed in a sustained environment (without toys, tunnels, etc.). After four weeks of inhabiting their separate environments mice were individually placed in a maze once every day for a course of twenty-two days. The amount of time spent searching for the end of the maze and the mistakes made (wrong turns in the maze) were recorded and graphed. Results indicated that there was a significant difference between the rate of learning for the enriched and sustained groups. Mice that had lived in the enriched environment made less mistakes and took less time in the maze than the sustained group. Results showed that the sustained group learned the maze a total of eleven runs later than the enriched group of mice.

10:30 EXPRESSION OF THE ORNITHINE DECARBOXYLASE GENE IN HEAD AND NECK CANCER. **Kris R. Jatana, 2235 Sandover Rd. Columbus OH 43220.**

The ornithine decarboxylase (ODC) gene is the first and rate limiting enzyme in the synthesis of polyamines; cells require polyamines to progress through the cell cycle. This investigation measured the expression of ODC in both normal and cancerous head and neck tissue samples taken from twenty-eight patients. The RNA was isolated from the tissue samples, and then a reverse transcriptase (RT) reaction was used to synthesize DNA. Using polymerase chain reaction (PCR), the ODC gene was amplified, and the expression of the ODC gene was measured. A statistically significant higher level of the ODC gene was found in the head and neck cancer tissue relative to the normal head and neck tissue from the same patient; the t-test had a p-value of 0.0005. Future directions include investigating the ODC enzyme activity and the polyamine levels in these tissue samples. Due to its critical role in the cell cycle, ODC is a possible target for therapeutic intervention.

10:45 ABNORMALITIES OF TUMOR SUPPRESSOR GENE P-16 IN SQUAMOUS CELL CARCINOMA OF ORAL AND LARYNGEAL-PHARYNGEAL TISSUES **Daniel G. Stover, 2140 Lane Rd., Columbus OH 43220.**

The p16 gene is considered a tumor suppressor, or gene that has the capability to inhibit or partially inhibit the growth of cells. Mutations in the p16 gene have been found to prevent the p16 gene from functioning as a cell growth inhibitor. The purpose of this research was to determine whether the quantity of mutations of the p16 tumor suppressor gene products differed between carcinogenic oral tissue (tongue) and carcinogenic larynx-pharynx tissue. Squamous cell carcinoma can develop in either type of tissue. Twenty eight samples of RNA from patients at the James Cancer Hospital were used. Each sample underwent RT-PCR (reverse transcription - polymerase chain reaction), in order to amplify a target gene. Three mutations of the twenty eight samples were found. There were zero mutations from the oral region, yet there were three from the larynx-pharynx region. Of those samples with base pair deletions, two had large and clean deletions (one full exon), from the same position in the DNA. These results as a whole seem to point to an increased susceptibility of the laryngeal-pharyngeal tissue to environmentally caused (ie alcohol or tobacco smoke) p16 mutations, thus cancer. After RNA is copied from DNA, the parts which are not translated for use in protein synthesis are removed/spliced out (introns), leaving a shorter mRNA containing only exons which will be translated into a protein. The two samples with identical mutations either have a mechanism removing an entire exon at some point during the above sequence, or there is a mutation at the end of the deleted exon, causing an entire intron-exon-intron sequence to be spliced out.

11:00 AN INVESTIGATION INTO THE PRESENCE OF FUNGI IN A SCHOOL VENTILATION SYSTEM. **Nicholas J. Douville, 3741 Westwind Dr., Dayton OH 45440-3531.**

Sick building syndrome is the condition of a building where more than 20 percent of its occupants experience adverse health effects with no clinical disease present. Occupants may get sick from poor air quality in a building so school vents should not contain infectious organisms, which may make students sick. Recent studies have also shown that metabolic gases from organisms, such as fungi, may even be a source of air borne volatile organic compounds. The purpose of this project was to sample a local school building for organisms that may cause uncomfortable symptoms or allergies in students. It was hypothesized that the school would contain infectious organisms. After a preliminary test which sampled various locations for fungi or bacteria, five school vents were tested for fungi and identified the fungi to see if they could be associated with Sick Building Syndrome. *Alternaria, Penicillium, Aspergillus, Aureobasidium,* and *Fusarium* were always found in the sampled vents. *Scopulariopsis, Paecilomyces,* and *Cladosporium* were found only in one trial. The results were repeatable for three trials. A control proved that fungi and bacteria could grow in another vent outside the school. One vent was cleaned to learn whether fungi could be easily eliminated or if the whole ventilation system was contaminated. The cleaning reduced the quantity of fungi growing, but fungi were still isolated on the cleaned vent. This investigation confirmed the hypothesis because infectious organisms were found in the school.

11:15 HERBS VERSUS ANTIBIOTICS. **Amy M. Decker, 101 Split Rail Ct., Bellefontaine OH 43311.**

Although healing herbs have been around for centuries, do they really have any medical significance? Will they be used to fight drug-resistant strains of bacteria? A study was conducted using herbs as a variable and antibiotics as the control. The investigation was done by disk susceptibility tests. Plate cultures of *Escherichia coli, Micrococcus, Pseudomonas putita,* and *Bacillus cerus* were grown. Then a disk of each of the following were placed in the plates; Nalidixic Acid, Ampicillin, Streptomycin, garlic, clove, Una De Gato, B-Complex, Spirulina, L-Formula Lysine, Beta-Carotene, and Calcium. Zones of inhibition were measured and compared. The antibiotics had the most consistent rate of susceptibility. Some herbs had large zones but others showed no susceptibility at all. Antibiotics have a higher susceptibility rate than herbs but future study may show that herbs work with bacteria to make substances that then in turn fight off the bacteria.

11:30 SOIL MICROBIAL BIODIVERSITY AND THE ISOLATION OF ANTIBIOTIC-PRODUCING ACTINOMYCETES. **Pete R. McDonald, 6404 Twp. Rd. 55, Bellefontaine OH 43311.**

The purpose of this project is to determine the microbial biodiversity of the soil by determining the number of colony forming units, as well as determining the main factors which influence the biodiversity of microbes, actinomycetes, and antibiotic-producing soil bacteria. In addition, the factors influencing the soil microbial biodiversity were determined, antibiotic-producing actinomycetes were isolated, and the factors influencing the distribution of these antibiotic-producing soil microbes were determined. Soil samples were obtained from varying locations. Serial dilutions were run, and the dilutions were plated out onto Actinomycete Isolation Agar and incubated. Current results reveal that particular actinomycete colonies have inhibited the growth of fungi, thus revealing the presence of antibiotics synthesized by the actinomycetes. Results indicate optimal conditions for locating new antibiotic producers to aid in the search for new antibiotics.

SESSION 24

Pre-college Afternoon

02:30PM Saturday, April 4, 1998

Johnston Hall 201

Amy M. Davis - Presiding

1:00 - 2:15 - View Pre-College Poster Session in Commons

2:30 THE EFFECTS OF VARIABLE GRAVITY ON THE LIFE CYCLE OF *TENEBRIO MOLITOR*.

Amy M. Davis, 2172 Lyndway Rd., Beachwood OH 44122.

A comparative study to elucidate the effects of low, normal, and high gravity on the life cycle of *Tenebrio molitor* was performed. *Tenebrio molitor* in their larvae stage were exposed to approximately 1.5 G and 2.0 G at High Inertial Rotation Behemoth ("HIRB") centrifuge at Clarkson University. Tenebrio molitor in their larvae stage experienced short duration exposure to approximately 0.0 G on NASA's DC-9 performing parabolic flight trajectories. Tenebrio molitor exposed to approximately 2.0 G and 1.5 G first reproduced 87 days after exposure to high gravity. A high gravity control group that stayed at NASA and a transportation control group that traveled to Clarkson University, but was not centrifuged first reproduced one day later. In a small sample of *Tenebrio molitor* that experienced parabolic flight trajectories, after 16 days, 50% reached their adult stage of metamorphosis, compared with 80% of the control group. A prolonged period of high gravity seemed to have had little effect on the life cycle of the *Tenebrio molitor*. However, the decreased maturation of larva exposed to low gravity for short intervals of time warrants further investigation.

2:45 DOES AIR CIRCULATION SPEED DECOMPOSITION IN LANDFILLS?

Julianne W. Neff, 1360 SR 314 N., Mansfield OH 44903.

The purpose of this project was to see if pumping air through a landfill would make the wastes decompose more quickly. Data was acquired by assembling two controlled landfills, in tanks, following the design of an actual landfill; plastic lining, clay, gravel and other materials that add to the limited air supply. Measured and weighed similar wastes were than used to fill the model landfills (vegetable and fruit peels, shredded paper, leaves, lettuce, egg shells, banana pieces.) The only difference between the two models was that one had air pumped throughout the landfill one hour daily. It was hypothesized that waste would decompose faster when exposed to air. Results indicated a faster rate of decomposition in the air circulated model as found by taking weekly samples of waste from each model. Also discovered were higher levels of nitrogen and higher temperatures in the air-circulated tank when checked over the same period of time. Therefore, the hypothesis was valid and with the higher temperatures and nitrogen levels.

3:00 FACTORS AFFECTING GERMINATION RATES OF *LUPINUS PERENNIS*.

Katie C.Abell, Dr. H. Michaels, Mr. S. Kelly, 51 Darlyn Dr., Bowling Green OH 43402.

L. perennis, a food source for the endangered Karner Blue butterfly, is a vital part of a vanishing ecosystem, the Oak Savannah. This two year research explores one of the steps needed to bring the native *L. perennis* back to the Oak Savannah. Year 1 determined which of several pre-germination conditions were best at simulating nature. For dormancy to be broken and germination to occur, an opening must be created in the seed coat though which water and essential nutrients can pass. Year 2 determined the most successful method of opening seed coats. Phase 1 identified the best method of heat-treating seeds and exposed procedural problems, which were corrected. Information from Phase 1 was applied to Phase 2. Phase 2 consisted of 7 treatments, stratification, scarification, heat:boiling water, 3 cross treatments, and a control. The seeds were placed in a growth chamber with a 12 hr photo period at 25°C. The seeds were monitored from 2/26 to 4/16/97. The stratification/scarification treatment had the highest rate of germination:85%. Stratification had a 64% germination rate; scarification showed a 62% germination rate. The seeds response to the cross treatment suggests a need for exposure to multiple conditions.

3:15 ELEVATED CO_2 AND THE GROWTH OF BEAN PLANTS.

Melinda Schottenstein, 6260 Park Rd., Indian Hill OH 45243.

The purpose of this project was to determine if an elevated CO_2 environment would increase the growth of bean plants. It was thought that since CO_2 is crucial to photosynthesis, and photosynthesis is what drives plant growth, then increasing the amount of CO_2 should increase plant growth. It was hypothesized that bean plants grown at twice ambient CO_2 levels would grow taller and have more mass than bean plants grown at ambient CO_2 levels for the same amount of time. Two groups of bean plants were grown in a greenhouse for a period of 18 days each. The control group was grown at ambient CO_2 levels, while the experimental group was grown at double ambient CO_2 levels. The two groups received identical lighting, heating and food. Measurements were taken at various areas around the greenhouse in order to determine normal atmospheric CO_2 levels. The average of the various measurements was 455 PPM. The experimental group received 910 PPM, which is double atmospheric CO_2 for the area surrounding the greenhouse. The average of mass measurements for the ambient group is 1.40 g, and for the elevated group, 2.02 g. This is a 44% increase in mass. The average of height measurements for the ambient group is 15.5 cm, and for the elevated group, 20.5 cm. This is a 32% increase in height. It is reasonable to conclude the elevated CO_2 had a positive effect on the bean plants. The information gained by this project can be used to increase plant yields for greenhouse gardeners. It can also help horticulturists prepare for a new kind of farming as they learn to adapt to potentially increasing CO_2 levels in Earth's atmosphere.

3:30 A STUDY OF *DIEFFENBACHIA* IDIOBLASTS.

Eric P. Bishop, Westlake High School, 3180 Oakwood Ln., Westlake OH 44145.

Idioblasts are specialized, spindle-shaped structure found in leaves and stems of the decorative plant *Dieffenbachia* and parts of some other plants. An idioblast shoots needle-like crystals called raphides from each end when perturbed. The goal of this research was to determine the variability of idioblasts in different species/varieties of *Dieffenbachia* and note the effect of solutes on their firing rate. The hypotheses were 1)idioblasts vary in size and shape between species/variety, 2) solute addition and concentration cause a difference in firing rate, and 3) physical pressure causes a difference in firing rate. Samples of Dieffenbachia were prepared for examination by crushing, dilution, and straining. Observations were made with an optical microscope at 100x. Physical pressure was exerted on idioblasts of different species/varieties with a tip of a sharpened pencil. Dimensions and density of idioblasts were found to vary with species/variety. Data support the conclusion that the idioblast firing mechanism is unrelated to addition of different solutes, such as sugar and sodium chloride. The sole stimulus which appears to initiate firing is physical pressure applied to the idioblast.

3:45 IS BETA-CAROTENE EFFECTIVE IN FIGHTING CANCER IN PLANTS.

Sameer Kishore, 1135 Summerhill Dr., Akron OH 44333.

Beta-carotene was investigated in this study for its effectiveness in suppressing plant cancers. It was hypothesized that beta-carotene would be an effective anti-cancer agent. Eight flowerpots with all-purpose potting soil were obtained. Ten sunflower seeds were planted in each pot, they were divided into four groups: A1, A2, B, and C. A1 was watered with five capsules of beta-carotene, mixed in with one pint of water. This was equal to 31.2 milligrams of beta-carotene per watering. Group A2 was watered with ten capsules of beta-carotene mixed in with one pint of water. This was equal to 62.5 milligrams of beta-carotene per watering. B and C were watered with ten milliliters of tap water for each watering. The plants were put under a growing light, and were watered on an average of two times a week. When the plants were seven to ten inches, A1, A2, and B were inoculated with *Agrobacterium tumefaciens*. Group C was used as a control for the experiment. The plants were studied over a period of 43 days. All plants inoculated grew tumors irrespective of whether they were watered with beta-carotene or water. At the end of the experiment, the plants were cut into sections and studied under a microscope. The cells from the tumorous areas showed evidence of cancer. The results did not support the hypothesis. Some of the reasons the hypothesis was not supported could be that beta-carotene wasn't getting absorbed by the plant. Beta-carotene is ineffective in stopping cancer, or the dosage of beta-carotene given was too low.

4:00 ISOLATION AND ANALYSIS OF PEROXIDASE ISOENZYME FROM *GLYCINE MAX*.

Dawn E. DeThomas, 5724 Pennywell Dr., Huber Heights OH 45424.

The goal of this project was to isolate an enzyme called peroxidase from soybeans using three different methods and them determine the enzyme activity. Of the three methods, it was hypothesized that SDS Page electrophoresis would provide the most accurate reading. The materials of the project include 250g of soybeans, potassium phosphate, blender, gauze pad, Diethylamininoethyl (DEAE)-Cellulose, potassium chloride, syringe tubes, Concanavalin (Con A)-Sepharose, Tris-HCl, sodium chloride, manganese chloride, methyl-alpha-D-mannopyranoside (sugar), distilled water, dialysis tubing, electrophoresis unit (specifically for protein separation, SDS Polyacrylamide gel, loading stain, coomassie blue, methanol, glacial acidic acid, scalpel, hydrogen peroxide, sulfuric acid, and potassium permanganate. The project proceeded as follows: soybean coats were removed, added to buffer, homogenized, and filtered The sample was then run through ion exchange chromatography, (DEAECellulose), and seven samples were collected: 5mls of each sample were stored separately for future enzyme assay. The remaining samples were then run through Con A-Sepharose: 5mls were also collected here for future enzyme assay and the remaining samples collected were run on SDS Page electrophoresis. After the enzyme assays, it was discovered that Con A produced the most activity, contrary to the original hypothesis.

4:15 AN EXPERIMENTAL STUDY OF MICROWEAR FORMATION AMONG MODERN AND PREHISTORIC STONE FLAKE TOOLS.

Michael J. Miller, 2135 Ashbrook St., Louisville OH 44641-2543.

This experimental research producing utilized and retouched flakes forms a data set similar to Late Woodland (ca. 800 B.P.) artifacts found at the Evie site (11CA428). These flakes formed diagnostic microwear patterns specific to flake function. Phase 1 analysis proves that when a flake of a specific material is activated in a particular direction on a specific material's surface, a diagnostic wear pattern is formed. Phase 2 study design designates a hypothesis that microwear patterns on replica stone flake tools can be successfully compared to archeological remains. These correlations are speculative of the actions occurring on site. Phase 2 research and artifact analysis concludes that stone flake tools associated with features are applicable to wear pattern simulations on replica flakes. Microwear analysis on these artifacts has led to a speculative employment of features prehistorically on the Evie site.

4:30 HOW THE COLOR OF LIGHT AFFECTS FILM.

Katrina A. Nicholl, 315 S. Detroit St., Bellefontaine OH 43311-1744.

Filters will correct for yellow from incandescent light, and green from fluorescent lights. A Mamiya 645 camera, Ricoh XRM camera, and Bogen tripod, were used in this study. In incandescent light, a Tiffen 80B filter, a Vivitar 285 flash, or Kodak Ektachrome 160T (Tungsten) 120 film were used. A Tiffen FLD filter, or a Vivitar 285 flash were used in fluorescent light. Kodak Royal Gold 100 & 200 ISO 135mm print film, Fujichrome 50 ISO and Kodak Ektachrome 400 ISO 120 slide films were used. Filter and flash were used together in both types of light. Pictures were taken twice, in five rooms of the church, three with fluorescent light, two with incandescent light. Color of light was corrected in three or four ways in each room. Pictures were taken with available light to compare. Sixty-six prints and eighty slides were taken, from which the best exposures were chosen. The film was developed in a local commercial lab. The lab was asked not to make corrections for color while printing the prints. Flash in incandescent light corrected for yellow. A filter helped but, left pictures slightly blue. The Tungsten film corrected for yellow, but was dark. A filter in fluorescent light left the picture slightly magenta. The flash removed green from the picture. When filter and flash were both used, the pictures were too blue or magenta, because of over correction.

4:45 HOW DOES THE CORIOLIS EFFECT IMPACT DYNAMIC EXPERIMENTATION IN SIMULATED GRAVITY ON A SPACE STATION? Jennifer F. Hoppe, 8902 Shadycreek Dr., Centerville OH 45458.

In order to investigate the impact of the Coriolis Effect on dynamic experimentation in a simulated gravity environment, its impact on the path of a sphere released on a rotating centrifuge was studied. After constructing a centrifuge using a 30 cm diameter circular table, a metal sphere was released and its path was traced as it rolled over a sheet of carbon and typing paper several times using multiple spin rates. The Coriolis Effect predicts the sphere will follow a curved path and the acceleration of the sphere will be perpendicular to the direction of its velocity. The measured position of the sphere in polar coordinates was extracted from the carbon paper and compared to the predicted position. In most cases, the measured data fit the predicted path within the estimated uncertainties. The path deviated most for the slower spin rates. Based upon the consistency of the data with the predicted path, it is possible to predict and measure the deflection which will occur due to the Coriolis Effect in this experiment and in a simulated gravity environment on a space station.

SESSION 25

Poster Session

9:00 - 11:00 AM

Saturday, April 4, 1998

Johnston Hall Commons

BOARD 01 RESPONSES OF *PROCAMBARUS CLARKII* AND *ORCONECTES RUSTICUS* CRAYFISHES TO FOOD ODOR: POTENTIAL IMPORTANCE OF OLFACTION IN A SPECIES INVASION. Craig Steele, Carol Skinner, Catherine Steele, Candice Mathewson and Philip Alberstadt, Dept. of Biology & Health Services, Edinboro University, Edinboro PA 16444.

Individual crayfish were presented with infusions of 10 ml of a feeding stimulant as either the undiluted filtrate, "Max" concentration (100%), or one of five other concentrations: 75%; 50%; 25%; 10%; or 0% (controls) of "Max". The feeding stimulant was presented to crayfish the day after regular feeding and after one week of food deprivation. Three components of food search behavior were analyzed: detection; probing (near-field search); and locomotion (distant search). Rank order of occurrence and its latency to initiation were recorded for each behavior. For *Procambarus clarkii* and *Orconectes rusticus* following regular feeding, high concentrations (≧50% "Max") of the stimulant induced probing (near-field search) prior to locomotion, while low concentrations (<50% "Max") induced locomotion prior to or even in the absence of probing. Detection always occurred first. These results indicate that chemical stimuli preferentially activate distant food search in both species and that a behavioral dichotomy exists between food search and feeding behavior. One week of food deprivation had no effect on the organization of food search behavior in *P. clarkii*. One week of food deprivation, however, did affect the organization of food search behavior in *O. rusticus* for those groups presented with 25% and 10% of "Max" concentrations: They probed prior to locomotion, which would not seem adaptive for natural populations. *Procambarus clarkii* appear to be more responsive to food odors than *O. rusticus*, which may give *P. clarkii* the ability to locate food more quickly and increase its feeding rate compared to *O. rusticus*.

BOARD 02 SHORE-FLY (DIPTERA: EPHYDRIDAE) COMMUNITIES IN RESTORED WETLANDS. Bruce A. Steinly, Zoology Dept., Miami University, Oxford OH 45056.

This investigation is the first study that documents changes in shore-fly (Diptera: Ephydridae) populations in restored wetlands and changes in shore-fly communities in restored wetlands of different ages. Wetlands are subdivided into habitats that are characterized by vegetation types (Scheiring and Foote 1973; Regensburg 1976; Steinly 1978, 1986). In the midwest, restoration projects have been initiated to provide habitat for endangered vertebrate populations that are dependent on wetland resources. Ultimately, successful restoration of wetlands and colonization by diverse vertebrate communities is dependent on the variety and abundance of primary consumers (Wilson 1987) i.e., shore flies. The purposes of this investigation is to identify shore-fly species that have recolonized restored wetlands, and document spatial and temporal changes in community structure. Unlike undisturbed aquatic habitats that harbor Hydrellia griseola from June-September, restored grass-shore and sedge-meadow habitats at Miami-Whitewater Park are dominated by Hydrellia tibialis. During May and June, *Leptopsilopa atrimana* was abundant in sedge meadows. Within mud-shore habitats, *Hyadina albovenosa, Lytogaster excavata, Paralimna punctipennis*, and *Parydra breviceps* were abundant in the spring while *Allotrichoma simplex, Parydra aquila, and Parydra quadrituberculata* populations increased during July and August. Large numbers of *Scatella stagnalis* were associated blue-green algal habitat. Abundance changes are statistically compared to identify shore-fly population shifts that may be attributable to wetland age and seasonal changes in habitat.

BOARD 03 COMPARATIVE STUDY OF THE CENTRAL NERVOUS SYSTEM OF DROSOPHILA MELANOGASTER AND OCHTHERA MANTIS. Jennifer E. Pyzoha and Bruce A. Steinly, Zoology Dept., Miami University, Oxford OH 45056.

The central nervous systems (CNS) of the sister families, Ephydridae (shore flies) and Drosophilidae (fruit flies), are examined. A comparative study of the CNS anatomy and morphology of Drosophila melanogaster (Diptera: Drosophilidae) and Ochthera mantis (Diptera: Ephydridae) is reported. Histological preparations are compared to determine gross CNS structural differences and similarities. Holme's silver-gold stain and Delafield's Hematoxyline and Eosin protocols were used to stain the CNS and associated nerve tracts. Differences in the structure of fruit-fly and shore-fly central nervous systems may be associated with reported differences in resource utilization and behavior. Significantly, Drosophilidae contains species that utilize the by-products of fermentation while species of Ephydridae exploit a diverse resource base. The Ephydridae includes predators (Ochthera mantis), parasites, leaf miners, herbivores, saprophytes, and bacterial feeders. The development of diverse external morphologies and the utilization of a broad resource base suggests that structural and life strategy changes are accompanied by CNS modification.

BOARD 04 SCANNING ELECTRON MICROSCOPY ON THE METAMORPHIC STAGES IN THE LIFE HISTORY OF THE WHITEFLY BEMISIA TABACI. Abigail A. King, David L. Mason, and Carmen E. Trisler, Biology Department. Wittenberg University, Springfield OH 45501.

This study concentrates on viewing the surface structures of the whitefly (Aleyrodidae) during stages of its life history by means of scanning electron microscopy. The first instar displays six functional tapering, jointed, appendages extending from the under- side of the body. This instar stage was seen actually moving on the the leaf while being view under the scanning microscope. In the later instars, the legs are seen as being retracted and non functional. On the dorsal side of all the instars there can be readily seen a vasiform orifice which structurally resembles the male reproductive organ in mammals. Its function has not been truly determined. On the ventral side of the instars can be observed a very thin, sinuous, hair-like, extension originating from a short, finger-like, process located just below the mid-section of the body. This tube is so slender that it cannot be seen under a light microscope. Documentation of this structure has not appeared in the literature. We propose that it is a feeding tube for the instars. In the adult fly the feeding stylet is seen as a stiletto-like tube extending from the underside of the head. Research on this organism is to continue, focusing primarily on the structure and function of the elongated hair-like extension.

BOARD 05 CHARACTERIZATION OF THE *RHODOBACTER SPHAEROIDES* DNAKJ OPERON. Anna H. Drejer (W. Theodore Lee); Kenyon College, Dept. of Biology, Gambier OH 43022-9623.

The dnaKJ operon from *Rhodobacter sphaeroides* has been isolated. *R. sphaeroides* is a metabolically versatile bacterium capable of growing under both photosynthetic and chemoheterotrophic conditions. The dnaKJ genes encode proteins that function as molecular chaperones in cells. Previous observations have indicated an involvement of the DnaKJ proteins with assembly of the form I ribulose bisphosphate carboxylase/oxygenase from R. sphaeroides (Lee and Tabita, unpublished observations). The characterization of the dnaKJ operon is of interest to investigate the regulation of these genes and the role of the DnaKJ proteins in photosynthetic growth. Initial sequencing of the dnaKJ operon indicates that it may be regulated differently from the groESL operon. The *R. sphaeroides* groESL operon contains a hairpin loop sequence, conserved in many other bacterial groESL and dnaKJ operons, present at the start of the mRNA transcript. The dnaKJ operon does not appear to contain this conserved inverted repeat.

BOARD 06 EFFECTS OF ETHANOL ON BLOOD GLUCOSE RESPONSE TO INSULIN. Charles H. Kim, James R. Hartness, (Kathryn T. Knecht), Ohio Northern University, Ada OH 45810.

Ethanol exposure affects blood glucose, but the nature of this interaction is not clear. Studies have shown both increases and decreases in blood glucose after ethanol administration, but experimental conditions for these studies have not been consistent. Factors such as species, age, nutrition, and manner of ethanol dosing may influence the net effect of ethanol onblood glucose. The purpose of these experiments is to elucidate the effect of the above factors on insulin response in conjunction with ethanol. The hypothesis is that ethanol administration will produce a consistent increase in insulin resistance once confounding factors are taken into account. Insulin response in mice (*Mus musculus* and *Peromyscus maniculatus*) will be measured after injecting insulin (1 mU/kg, i.p.) and analyzing infraorbital blood samples at subsequent hourly intervals with a One Touch glucometer. Preliminary results show that insulin response decreases with age and with chronic ethanol administration, and that basal glucose levels and insulin response differ in the two species studied.

BOARD 07 INVESTIGATION OF EVENTS ASSOCIATED WITH THE LOSS OF THE *COX*2I1 IN FLOWERING PLANTS. Junjun Ouyang, Dept. of Botany, Miami University, Oxford OH 45056, M. R. Sinden, E. R. Zuehlke, F. Dong, K. G. Wilson and Y.-L. Qiu, Department of Biology, Indiana University, Bloomington IN 47405.

The *cox*2 gene, present in most higher plants, encodes the cytochrome c oxidase submit II. In most flowering plants, the coding region of this gene is interrupted by two introns (*cox*2i1, one intron near the 5' end; *cox*2i2, the other near the 3' end.) In a broad survey, we determined, by Southern Blotting, that *cox*2i1 is absent in at least seventeen lineages. By investigating the sequences of the *cox*2 genes from these lineages, we will test the hypothesis, that the loss of *cox*2i1 involving a cDNA intermediate. This hypothesis involves the removal of the intron from the RNA by splicing, reverse transcription, and recombination between the cDNA and its parent gene. Associated with these events is RNA editing, which modifies some bases in the RNA, e.g. the conversion of specific cytosine (C) residues into uracil (U) residues. Thus, the cDNA produced from a mature mRNA will contain Ts in place of Cs at those sites. Through recombination, the derived DNA contains, such as Ts, the "pre-edited" sites. We got the correspondent size of PCR products of *cox*2 genes from 35 plants, which represent those seventeen lineages. Sequencing analysis of 14 PCR products indicates that, the loss of *cox*2i1 is correlated with multiple mutational

changes (pre-editing, C to T) in the regions flanking the expected position of the intron. Non-editable sites are not affected. These results support the proposed hypothesis of the intron loss.

BOARD 08 CONTEMPORARY CARDIAC REHABILITATION:PATIENT CHARACTERISTICS & TEMPORAL TRENDS OVER THE PAST DECADE. **Laura A Richardson, Brian D Bauman, Philip J Buckenmeyer, James S Rosneck, Isadore Newman, and Richard A Josephson, with the technical assistance of David Newman. Summa Health System c/o Richard Josephson, 55 Arch St, Akron OH 44304.**

Cardiac rehabilitation (rehab) is a comprehensive therapeutic exercise and patient(pt) education program for people with coronary artery disease (CAD), those who have undergone catheter based interventions, cardiac surgery, survived myocardial infarctions or pts with stable angina pectoris. Treatment of CAD has evolved from limited medical interventions and coronary artery bypass grafting (CABG) to less invasive procedures including thrombolytic therapy, and angioplasty. Pt profiles have also changed with an increase in surgery among the elderly population. Therefore we sought to determine how the changing treatment of CAD influenced the pt demographics of our cardiac rehab Phase II program. Data were prospectively acquired and retrospectively analyzed on approximately 2,000 pts from our Phase II rehab from 1986-96. Charts were reviewed and analyzed using chi-square and t-test formulas. There has been a dramatic change in pt demographics. Pt volume has increased(1986-52 pt,1991-144 pt, 1996-309 pt, $p<0.5$). The % of women has increased(1986-23%,1991-27%,1996-29%,$p<0.5$), as has the elderly(1986-27%$\geq$65 yr.,1996-49%$\geq$65 yr.,$p<0.5$). The % of pts referred shortly after CABG grew from 43% to 50% over the decade of study. With the increase in catheter-based interventions, post PTCA patients also grew from 15% to 33%. Contemporary rehab in this facility is serving an increasing number of patients who are older, at higher risk, and have different clinical features than in previous. Cognizance of this data is important for the effective administration of rehab programs.

BOARD 09 SINGLE VESSEL CORONARY REVASCULARIZATION IN THE MODERN ERA: DEMOGRAPHICS AND PRELIMINARY OUTCOMES. **Arene Manneh, Isadore Newman, Ed Syron, Richard Josephson, with the assistance of Diane Jasso and Karen Mitchen. Summa Health System and the University of Akron, Akron OH. c/o Richard Josephson, 55 Arch St., #1A, Akron OH 44304.**

Revascularization of the left anterior descending coronary artery(LAD) is an important, evolving, and controversial topic. Previous options included balloon angioplasty (PTCA) and standard coronary artery bypass grafting(CABG).New techniques have evolved including intracoronary stents, which may improve the results of PTCA, and minimally invasive direct coronary artery bypass (MIDCAB), a less invasive surgical procedure with faster recovery. The purpose of this retrospective study was to evaluate our recent experience with 190 patients who have undergone LAD revascularization. There were important baseline differences between 35 patients undergoing surgical procedures vs. 155 undergoing PTCA. PTCA based patients were more often female, diabetic, and less often had congestive heart failure. Initial hospital stay was shorter and less costly for PTCA. However, medium term follow-up revealed a greater need for repeat cardiac hospitalizations (43% vs. 6%) and follow up costs were higher in the PTCA group. Thus, the lower initial cost and resource utilization demonstrated by PTCA diminishes with time. This study provides important data on a population where revascularization could be performed by multiple techniques and is currently guided by clinical judgement. Multivariate analysis is in progress to determine if the ultimate outcomes are driven more by baseline patient related factors or by choice of revascularization strategy.

BOARD 10 GENETIC CONTROL OF DIFFERENTIATION AND *ANTIGEN 5-RELATED* GENE EXPRESSION IN EMBRYOS OF *DROSOPHILA MELANOGASTER*. **Ryan C. Jay (Gae Kovalick) Department of Zoology, Miami University, Oxford, OH 45056.**

Differentiation is the process by which cells acquire specialized functions. Identifying the genetic mechanisms by which cells control this process is one of the fundamental problems of developmental biology. This research focuses on how the cells of the *Drosophila* proventriculus acquire their unique identity, specifically by examining how the *Antigen 5-related (Agr)* gene is activated within the proventriculus during the embryonic stage. Evidence suggests that the *Agr* gene encodes a protein found only in differentiated cells and can be used as a marker for differentiation within the proventriculus. By studying the genetic regulation of *Agr* activity, I can also identify those genes necessary for differentiation. I am dissecting the genetic pathways controlling *Agr* activity by using *in situ* hybridization of an *Agr* RNA probe to whole embryos that carry mutations in genes that affect the proventriculus. The genes that are being studied fall into two categories: Those that encode transcription factors present within the proventriculus, and those that regulate morphogenesis of the proventriculus. Genes in the first category include *canoe (cno), POU-domain 1 (pdm1),* and *sloppy-paired 1 (slp1),* while those in the second category include *hedgehog (hh), wingless (wg),* and *myospheroid (mys).* If a mutation in a particular gene alters *Agr* gene activity, then the gene most likely regulates *Agr,* and most likely participates in differentiation of the proventriculus. If that gene is also involved in the morphogenesis of the proventriculus, it would suggest that morphogenesis and differentiation are linked, with some genes controlling both processes.

BOARD 11 TOXICITY OF PLETHODON CINEREUS: IMPLICATIONS FOR DISTRIBUTION AND MIMICRY. **Jennifer C. Lawton, George J. Picha, (Linda C. Zimmerman). Denison University, Granville, OH 43023.**

In this study we examined the distribution of the three color morphologies of *Plethodon cinereus*, their possible toxic or noxious natures, and related environmental factors that could explain these color variations. The most commonly published explanation for the different color morphologies is mimicry of the strongly toxic red eft, *Notophthalamus viridescens*, and the less toxic red salamander, *Pseudotriton ruber.* However, it has not been determined whether *P. cinereus* is noxious or toxic itself. Alternative explanations for the color morphologies include thermoregulation and genetic isolation. We censused local populations, measuring size, stripe length, and coloration of individuals. In addition, tail breaks were noted as indicators of predation. Skin secretions were obtained in the field by swabbing individuals to acquire potential toxins. These samples were then analyzed using thin layer chromatography (TLC) to separate compounds. The TLC yielded no detectable bands, indicating that either no secretions were obtained from the swabbing technique or that the secretions did not contain detectable compounds. To determine this, infrared spectroscopy was used to test the samples with higher sensitivity or to confirm the initial negative results. Further tests into the toxicity of *P. cinereus* are warranted. The different color morphs do co-occur within local populations, although each is most abundant in a different geographical area. These findings, in conjunction with the literature, do not support the explanation that the color morphs of *P. cinereus* are due to mimicry.

BOARD 12 THE EFFECTS OF MET-ENKEPHALIN ON PROLACTIN AND GROWTH HORMONE RELEASE IN MALE AND FEMALE RATS. **Mark J. Donatelli, Phyllis Callahan and James M. Janik, Dept of Zoology, Center for Neuroscience, Miami University, Oxford, OH 45056.**

The endogenous opioid peptides (EOP) are a family of morphine-like peptides that participate in the regulation of Prolactin (Prl) and Growth Hormone (GH) secretion. While previous studies using beta-endorphin demonstrated that it is a potent stimulator of Prl release, the GH response was not as robust. The purpose of this work was to investigate the effect of a different endogenous opiate, met-enkephalin, on Prl and GH release in male and female rats. The enkephalins are a second major family of EOP. Male and female Sprague-Dawley rats received chronic intra-ventricular cannula under ketamine/xylazine anesthesia. After 5 days of recovery, the rats were implanted with an intravenous cannula. On the day of the experiment, basal blood samples were withdrawn and the animal was injected with 1 mg met-enkephalin and 5 mg, n-carboxy-methyl-phe-leu, an enkephalinase inhibitor. In the first set of experiments, additional blood samples were withdrawn 5, 10, 15 and 30 minutes after drug administration. Prl release was stimulated but it was a rapid, transitory response. Therefore, a second set of experiments was performed in which blood samples were withdrawn 3, 5, 10 and 15 minutes after the injections. Enkephalin did not stimulate GH secretion in either males or females, but it stimulated Prl release in both genders, and the magnitude of the response was greater in the males. This differs from the Prl secretory response to beta-endorphin in which females were more sensitive to beta-endorphin stimulation. Administration of higher doses of enkephalin are currently being examined. (Supported by NIH grant #HD30375 to JJ and PC and Miami University Undergraduate Summer Scholarship Award (USS) and Research Grant (URG) to MD.)

BOARD 13 ACTIVE VAPOR SORPTION IN AMERICAN DOG TICKS (ACARI: IXODIDAE) ADULTS AT LOW TEMPERATURE. **Matthew J. Brunelle (R. L. Stewart and G. R. Needham), The Ohio State University, Dept. of Entomology, 211 Biological Sciences, 484 W. 12th Ave., Columbus OH 43210.**

We are evaluating the ability of American dog ticks, *Dermacentor variabilis*, to actively uptake water at various low temperatures. The survival of ticks likely depends heavily on their ability to actively take up water. This will aid in our understanding of how ticks endure periods of harsh temperatures during winter. We hypothesize that there is a lower temperature threshold, near freezing, where ticks can no longer uptake water. Pre-desiccated ticks were placed under saturated conditions at low temperatures and re-weighed daily to determine their ability to re-hydrate. Thus far, all ticks have regained water lost during desiccation at temperatures higher than 10°C. Future studies will evaluate re-hydration ability at temperatures near freezing.

BOARD 14 CERCAL MOVEMENTS IN THE CRICKET: EFFERENT ANATOMY, PHYSIOLOGY AND ROLE IN BEHAVIOR. **L. C. Snell and K. A. Killian, Dept. of Zoology & Ctr. for Neuroscience Research, Miami University, Oxford OH 45056.**

The cerci of the cricket, *Acheta domesticus*, are cone-shaped appendages located on the animal's terminal abdominal segment and are covered with sensory receptors innervated by sensory neurons that are sensitive to wind, tactile, and sound stimulation. The role of the cercal sensory system in eliciting escape running and defensive kicking has been well characterized (Dumpert, K and Gnatzy, GW, *J. Comp. Physiol. 122*:9-25, 1977; Camhi, JM, et al., *J. Comp. Physiol. 128*:203-212, 1978). However, during reproductive behavior, these escape and defensive reflexes are inhibited and the cerci function to position the male under-neath the female so that copulation can occur. In order to better understand this behavioral switch in cercal function, we characterized the musculature responsible for cercal movements with a cobalt-backfill technique. We also utilized intracellular electrophysiological recording techniques to identify the motor neurons in the terminal abdominal ganglion of the central nervous system of the cricket that innervate these muscles. By stimulating the cercal motor neurons with intracellularly injected depolarizing current pulses and thus causing muscular contraction, we were able to categorize the range of possible cercal movements. Identification and characterization of the cercal motor neurons and musculature is necessary for not only determining the neuronal mechanisms responsible for these cercal movements, but also for understanding how these movements can have a role in two conflicting behavioral responses: reproduction and escape.

BOARD 15 MALE RED-WINGED BLACKBIRDS (*AGELAIUS PHOENICEUS*) VOCAL RESPONSE PATTERNS TO ANALOG AND DIGITAL PLAYBACK STIMULI. **Christina Beam, Lauren Murphy, Carrie Kozik, and Grant McLaren, Ph.D. The Bioacoustic Research Program, Department of Psychology, Edinboro University of Pennsylvania, Edinboro, PA 16444.**

The objective of this study was to compare the vocal responses of male red-winged blackbirds to analog and digital versions of the same male conspecific display song. The original analog version was digitized using Canary software (Cornell Bioacoustic Workstation, v 1.2.1, 1995) and a Macintosh 7200/120 computer equipped with a math coprocessor. In this between subjects design experiment, ten male red-winged blackbirds were observed in their natural breeding habitats. Observations were conducted during May and June of 1997 in various locations throughout northwestern Pennsylvania. The ten male red-winged blackbirds were assigned to two groups. The five males in Group 1 were exposed to the analog version of the male conspecific display song, while the five males in Group 2 were exposed to a digitized version of the same male conspecific display song. The first male observed was randomly assigned to either the analog of digital stimuli, while the remaining nine red-wings were sequentially assigned to either the analog or digital stimuli. The stimuli was presented using a modified cassette tape recorder and a powered field speaker. The vocal response patterns of each bird were recorded with an additional tape recorder, an external microphone, and a parabolic recording dish. The individual observation period for each bird consisted of a 5 min Pre-playback, a 5 min stimulus Playback, and a 5 min Post-playback period. All vocal response patterns were recorded during the 15 min continuous observation period. During the 5 min stimulus Playback period, the birds in Group 1 were exposed to the analog version of the display song while the birds in Group 2 were exposed to the digitized version of the same conspecific display song. During the stimulus Playback period, the stimulus was presented once every 10 sec for 5 mins for a total of 30 presentations. The major goal of this study was to determine whether male red-winged blackbirds respond differently to the analog and digital versions of the same vocalization. Initial analysis indicates that the vocal response patterns are not significantly different between Group 1 and Group 2. Therefore, digital stimuli can be used to further investigate behavioral and species-specific significance of vocalizations of male red-winged blackbirds.

BOARD 16 VOCAL RESPONSE PATTERNS OF MALE RED WINGED BLACKBIRDS (*AGELAIUS PHOENICEUS*) TO DIFFERENT SEGMENTS OF A DIGITALLY MANIPULATED MALE CONSPECIFIC INTRUDER'S DISPLAY SONG.

Brenda Telesz, Lauren Murphy, Christina Beam, Carla McAlevy, Eric Bieniek, Grant McLaren Ph.D, The Bioacoustic Research Program, Dept. of Psychology, Edinboro University of Pennsylvania, Edinboro, PA 16444.

The objective of the current study was to determine whether or not the male red-winged blackbird would produce significantly different vocal patterns in response to individual, but acoustically different segments of a digitally manipulated song of a con specific male intruder. If the male red-wing provides a significantly different vocal pattern to one segment of a con specific intruder's display song, while providing little or no vocal response to the additional segment of the intruder's display song, the data may suggest that certain segments of the display song transmit important species-specific information. Fifteen free-living male red-winged blackbirds were observed in their various natural breeding habitats in northwestern Pennsylvania from June through July, 1997. The fifteen male birds were assigned to three groups in this between-subjects design experiment. The five birds that were assigned to Group 1 were exposed to a digital version of a complete con specific male intruder's display song. The additional ten birds were assigned to Group 2 or Group 3 and were exposed to either a digital version of the initial segment or the terminal segment of the con specific male intruder's display song, respectively. Each bird was observed for 15 consecutive mins during a 5 min Pre-playback, a 5 min Playback, and a 5 min Post-playback period. In each stimulus Playback period the males were exposed to the stimulus signal every 10 sec, for a total of 30 presentations during the 5 min Playback period. The original analog con specific male intruder display song was digitized using Canary Software (Cornell Bioacoustic Workstation, v. 1.2.2, 1995) and a Macintosh 7200/120 computer equipped with a math coprocessor. The preliminary data analysis indicates that the male red-wing yields a more active vocal response repetiore during the presentation of the full display song and the terminal segment of the display song in comparison to the initial portions of the display song. The data from this study will be used to further investigate the potential significance of vocalization patterns in the transfer of species-specific information, territorial, and reproductive behaviors of red-winged blackbirds in habitats South of Lake Erie in Southern Erie county.

BOARD 17 MALE RED-WINGED BLACKBIRD (AGELAIUS PHOENICEUS) VOCAL RESPONSE PATTERNS TO DIFFERENT PRESENTATION RATES OF CONSPECIFIC PLAYBACK STIMULI.

Lauren Murphy, Robert Bearfield, Christina Beam, Brenda Telesz, and Grant McLaren Ph.D., Bioacoustic Research Program, Dept. of Psychology, Edinboro University of Pennsylvania, Edinboro PA 16444.

The vocal repertoire responses of male red-winged blackbirds to conspecific digital playback presentations were observed in this between-subjects design experiment. The objective was to measure whether a faster presentation rate of a stimulus would elicit a higher response rate from the male red-winged blackbirds. Free-living male red-winged blackbirds were observed within their varied breeding habitats in Northwestern Pennsylvania from May 5 through June 9, 1997. Female red-winged blackbirds were present in the breeding habitats during the observations in this experiment. The 10 male birds were randomly assigned to two groups. Each of the 10 birds were individually exposed to a 5 min pre-playback, a 5 min playback, and a 5 min post-playback period in a continuous sequence. In Group 1, the stimulus was presented approximately at 10 sec intervals during the 5 min playback period. In Group 2, the stimulus was presented approximately at 5 sec intervals during the 5 min playback period. In sum, the birds in Group 1 received 30 presentations of the stimulus, while those in Group 2 received 60 stimulus presentations giving Group 2 more presentations at a faster presentation rate. A modified cassette tape recorder and a powered field speaker were placed in the territory of each bird to conduct the playback sessions. An additional tape recorder, microphones, and a parabolic recording dish were used to record the vocal responses of the male birds. The original analog male display song used as the stimulus in this experiment was digitized via Canary (The Cornell Bioacoustic Workstation 1.2.1, 1995) bioacoustic software and a Macintosh 7200/120 computer equipped with a math coprocessor. The preliminary data analyses from this study suggest that male red-winged blackbirds respond at a higher rate to the faster stimulus presentations. The data suggest that the male red-wing blackbird provided more aggressive vocal responses to the more rapid presentation rate.

BOARD 18 VOCAL RESPONSE OF MALE RED-WINGED BLACKBIRDS (*AGELAIUS PHOENICEUS*) PRESENTED WITH A ONE-SYLLABLE OR TWO-SYLLABLE DIGITAL STIMULUS.

Carrie Kozik, Christina Beam, Lauren Murphy, Tina Weed, and Grant McLaren, Ph.D., The Bioacoustic Research Program, Dept. of Psychology, Edinboro University of Pennsylvania, Edinboro, PA 16444.

The objective of the present between-subjects design experiment was to determine the potential differences in the vocal response of male red-winged blackbirds to digital manipulations of their conspecific vocalizations. All of the free-living birds in this study were observed in their natural breeding habitats located in Northwestern Pennsylvania during June and July, 1997. Specifically, ten male red-wings were randomly presented either a one-syllable or a two-syllable digital version of the high frequency male whistle. A modified cassette tape recorder and a powered field speaker were placed in the territory of each bird to present the playback stimulus. An additional tape recorder, microphones, and a parabolic recording dish were used to record the vocal responses of the male red-wings observed in this playback study. Five male red-wings were assigned to Group 1 and were presented with a one-syllable stimulus. The remaining five males were assigned to Group 2 and were presented with a two-syllable stimulus. The observation periods for each group consisted of a 5 min Pre-playback, a 5 min stimulus Playback, and a 5 min Post-playback period. Each bird was observed for a total of fifteen continuous mins. During the Playback period, the red-wings in Group 1 and Group 2 were presented with their respective digital stimuli every ten seconds for five minutes. Therefore, each bird received 30 discrete stimulus presentations during the 5 min Playback period. The one and two-syllable conspecific digital stimulus signals used in this study were generated from two original analog recordings collected during the spring of 1996. These original analog signals were digitized with a Macintosh 7200/120 computer equipped with a math co-processor and Canary software (Cornell Bioacoustic Workstation, v. 1.2.1, 1995). The preliminary data analyses suggests that the male red-wings increased their vocalizations in response to the one-syllable and two-syllable stimulus presentations. However, it is not clear whether or not the male red-wing distinguishes between the two different vocal stimuli with different vocal response rates.

BOARD 19 PATTERNS OF PHYLOGENETIC DISTRIBUTION OF DIGESTIVE PROTEASES AMONG BEETLES (COLEOPTERA).

Dan Rabosky and Kelly S. Johnson, Dept. of Biological Sciences, Ohio University, Athens OH 45701.

As part of an ongoing survey examining the phylogenetic distribution of cysteine (thiol) type proteases among the Coleoptera (Insecta), the presence or absence of cysteine proteases was determined in 7 previously uncharacterized species. Whole gut homogenates were assayed in the presence and absence of E64, a powerful cysteine protease inhibitor, to determine the contribution of cysteine type proteases to overall proteolytic activity towards a model protein (azocasein). The survey extended the known distribution of cysteine proteases to the superfamily Cleroidae, with the hypothesis that cysteine proteases are highly conserved and limited to the Cucujiformia. Additionally, examination of 3 species within the Cerambycidae confirms a pattern of secondary loss of cysteine proteases in this group. Although factors associated with gain or loss of cysteine proteases are not well understood, the two protease classes differ in the physicochemical conditions necessary for optimal proteolytic efficiency. The relationship between protease types present and optimal gut pH for total proteolytic activity was examined in 5 species over a pH range of 5.5-10.5. In general, a reasonable correlation between pH optima and predominant protease type was noted. In species that utilize both cysteine and serine proteases, the gut appears to be differentiated into various functional regions defined by protease type and pH. Correlations between protease types, gut pH, and phylogenetic history should provide insight into the ecological factors underlying the diversity of digestive strategies observed throughout the Coleoptera.

BOARD 20 ANALYSIS OF THE PREVALENCE OF *PSEUDOMONAS AERUGINOSA* SEROTYPES 0:3, 0:6, AND 0:11, AT THE MEDICAL COLLEGE OF OHIO HOSPITAL.

Courtney C. Brickner, Atreyi Dasgupta, Jaclyn M. Martin, Jason J. Welch, Edward D. O'Donnell, and Roudabeh J. Jamasbi, Dept. of Biological Sciences & Medical Technology, Bowling Green State University, Bowling Green OH 43403 & The Medical College of Ohio, Toledo OH 43699.

The aim of the current study was to determine the frequency of infections caused by *P. aeruginosa* at the Medical College of Ohio hospital. This bacterium, a known agent of nosocomial infections, is notorious for exhibiting resistance to a wide variety of antibiotics. Analysis involved generating three monoclonal antibodies, 4F, 11E, and 7-2C, against serotypes 0:11, 0:6, and 0:3. One-hundred and six isolates were tested using indirect enzyme linked immunosorbent assay (ELISA), immunofluoresence, and immunoblotting. Further investigation into the biochemical properties of all positive strains were also performed. Of the one-hundred and six samples, 52.8% were typed as serotype 0:11, while 11.3% and 10.4% were typed as serotypes 0:6 and 0:3, respectively. In earlier studies, the prevalence of *P. aeruginosa* serotypes 0:3, 0:6, and 0:11 were obtained for three other Northwest Ohio institutions (St. Rita's Medical Center, the Toledo Hospital, and St. Vincent Medical Center), by using similar testing methods. Results of those studies, however, differed from the results obtained for the Medical College of Ohio.

BOARD 21 THE INCIDENCE AND ETIOLOGY OF CONGENITAL DIAPHRAGMATIC HERNIAS (CDH) IN FIVE COUNTIES OF NORTHEASTERN OHIO. Jere M. Boyer, Aultman Hospital, Canton OH 44710, Martha Magoon, Michael Krew, Claire Bourguet, Mark Bewley, Myra Delos Reyes, Helen Hsu, Matt Mark, Mrunal Shah, Northeastern Ohio Universities College of Medicine.

Congenital Diaphragmatic Hernias CDH causes about 10% of birth defects in the U.S. Birth defects have now surpassed prematurity as the leading cause of perinatal mortality. The average cost of care for a neonate with a CDH is $137, 000. The area around Stark County has a reputation in the medical community as having a high rate of CDH. This preliminary case-control study examined hospital, birth and death records from 1993 - 1995 for CDH cases in Holmes, Carroll, Tuscarawas, Stark and Wayne Counties. Perinatal, maternal and paternal data were collected with a total of 38 variables obtained. A total of 18 cases was found with sufficient data to analyze. Twenty-eight controls were appropriately matched for comparison with the CDH group. The incidence of CDH in the study area was 4.3/10,000 live births. Odds ratios and 95% confidence intervals were calculated around the odds ratio for each variable. Preliminary associations of CDH with maternal age, history of preterm births, lack of first trimester care, weight gain less or equal to 15 lb., history of STD, lack of prenatal vitamins, and paternal age >40 were found. However, lack of first trimester care was the only variable whose confidence interval did not include 1.0. Results obtained for this study were compared with larger studies elsewhere. Future studies will include more years in order to increase the number of CDH cases examined.

BOARD 22 ANALYSIS OF POLYMORHPIC DNA FRAGMENTS (RAPD) FROM STONEROLLER FOR USE AS PROBES FOR THE MEASUREMENT OF GENETIC DIVERSITY. LoriAnn Gannon[1], Julie Mercer[1], Heather Skaggs[1], Denise Gordon[2], "Greg Toth[2]" and Douglas J. Burks[1], [1]Dept. of Biology, 251 Ludovic St., Wilmington College, Wilmington OH 45177 and [2] Ecological Exposure Research Division-MD642, United States Environmental Protection Agency, Cincinnati OH 45268.

RAPD (Randomly Amplified Polymorhphic DNA) analysis of the genetic diversity of stoneroller (*Campostoma anonmalum*) populations was undertaken. RAPD analysis of genetic variation is limited because RAPD polymorphic bands are considered co-dominant markers in that one either sees or does not see an individual DNA band in the analysis of an individual fish. Heterozygous individuals can not be identified nor can loci with multiple alleles. The goal of the present study is to identify allele families from polymorphisms identified by our RAPD analysis. By cloning polymorphic DNA fragments we should be able to identify all the alleles for each polymorphic band identified by RAPD analysis. With this information new primer probes can be developed to assess the genetic variation in stoneroller populations using PCR which will allow a more robust measurement of genetic variation. We call this approach of developing primers to study heterozygosisty at specific random loci SCALP's analysis (Sequence Characterized Anonymous Length Polymorphisms). Polymorphic DNA bands from (stoneroller) will be cloned into plasmid vectors for analysis. Approximately 60 to 90 clones will be analyzed by Southern analysis and DNA sequencing to identify alleles from the same loci. From loci with multiple alleles new PCR primers will be developed for SCALP's analysis of population studies.The specific goal of the present project is to develop the clones for the development of SCALP probes and to identify polymorphic loci within the clones using dot blot and Southern analysis.

BOARD 23 MOLECULAR AND BIOCHEMICAL ANALYSIS OF Gly195 OF THE *NifM* IN *AZOTOBACTER*. Tiffany Chandler, Ryan Schreiner, Dieter Knowle, Ekem Efuet, Lakshmi Pulakat and Nara Gavini, Dept. of Biological Sciences, Bowling Green State University, Bowling Green OH 43403.

Nitrogenase is a complex enzymatic system which is involved in the reduction of atmospheric nitrogen into the biologically usable form of ammonia. The nitrogenase system utilizes over 20 nitrogenase-specific proteins in the assembly and modification of its component proteins, and in the regulation of the system's expression. While some of the core proteins directly involved in the fixation of nitrogen have been characterized, many of the component proteins, like the *NifM* which is involved in the regulation and maturation of the nitrogenase remains poorly understood. The *NifM*-proteins from a number of nitrogen fixing organisms show relatively weak homology. The highest homology located is in the C-terminal region suggesting that this portion of the protein may be responsible for its function. Initially we have cloned the *nifM* from *Klebsiella pneumoniae* mutants that are defective in the NifM function and subjected them to nucleotide sequence analysis. This analysis served us as a guide-line in generating site-directed mutants of *Azotobacter vinelandii nifM*. In this work we have characterized the Gly195 of the *NifM* in relation to its biochemical properties. Furthermore, a mechanistic role for Gly195 *NifM* in regulating the activity of the Fe-protein of nitrogenase will be discussed.

BOARD 24 PREVENTION OF APOPTOSIS IN STAGE V OOCYTES OF *XENOPUS LAEVIS*; POSSIBLE ROLE OF BCL2. Shannon Cooper, Jason Dittus, Nara Gavini and Lakshmi Pulakat, Dept. of Biological Sciences, Bowling Green State University, Bowling Green OH 43403.

Stage V oocytes of *Xenopus laevis* are routinely used for expression studies of exogenous receptors. Since rat Angiotensin II receptor subtype AT2 is shown to induce apoptosis in R3T3 cells and PC12W cells, we determined whether these receptors could induce apoptosis in stage V oocytes of *Xenopus laevis*. Oocytes were microinjected with cRNA encoding rat AT2 receptor and the expression of rat AT2 receptor was determined by radioligand binding studies. The oocytes expressing rat AT2 receptors were then exposed to different concentrations of Ang II for different time-periods. No significant cell-death was observed during these treatments. Next we determined if other known apoptotic agents could induce cell death in these oocytes. Although treatment with cycloheximide and rifampicin induced cell death in oocytes, the cell death did not seem to be due to the induction of apoptosis. This conclusion was based on the observation that agarose gel electrophoresis analysis of the chromosomal DNA isolated from the oocytes treated with cycloheximide or rifampicin did not show the characteristic chromosomal DNA fragmentation and ladder formation apototic specific cells. Since Bcl2 is known to prevent apoptosis in many cell lines, we analyzed to see if Bcl2 has a role in preventing induction of apoptosis in stage V oocytes. Therefore we microinjected the oocytes with anti-Bcl2 antibody and investigated whether a control experiment was performed by microinjecting oocytes with saline. Within four hours of injection, the oocytes microinjected with anti-Bcl2 antibody were dead, whereas the oocytes microinjected with saline were not affected. The implications of these observations and the possible role of Bcl2 in preventing the induction of apoptosis in stage V oocytes of *Xenopus* will be discussed.

BOARD 25 ROLE OF THIRD INTRACELLULAR LOOP IN DETERMINING THE BINDING PROPERTIES OF RAT ANGIOTENSIN II RECEPTOR TYPE AT2: Jason J. Dittus, Nara Gavini and Lakshmi Pulakat. Department of Biological Sciences, Bowling Green State University. Bowling Green OH 43403.

The Ang II receptor subtype AT2 is a 7-transmembrane domain-protein that shares only 34% homology with the Ang II receptor subtype AT1. Unlike AT1 receptor, AT2 receptor does not demonstrate the GTPgS-induced shift to a low affinity form and does not activate the Gq-protein mediated PLC pathway. However, several amino acids that are crucial for ligand binding, G-protein coupling, and receptor activation of the Ang II receptor subtype AT1 are conserved in the AT2 receptor. A comparison of the three intracellular loops of the AT1 and AT2 receptors has shown that the homology is lowest in the third intracellular loop (3rd ICL) of the AT2 receptor. To test whether the 3rd ICL of the AT2 receptor makes the AT2 receptor functionally different from the AT1 receptor, we have generated a chimeric protein (AT2:AT1A3rd ICL:AT2) in which the 3rd ICL of the rat AT2 receptor is replaced by the 3rd ICL of the rat AT1A receptor. The ligand binding and G-protein coupling properties of this chimeric receptor were analyzed by using Xenopus oocytes as an expression system. The chimeric receptor had a very reduced affinity to Ang II and the peptide antagonist 125I-[Sar1 Ile8]Ang II. Currently we are also analyzing if the chimeric receptor binds losartan, the AT1 receptor specific ligand.

BOARD 26 MOLECULAR AND GENETIC ANALYSIS OF PLOIDY IN BACTERIA. Ekem Efuet, Nara Gavini, and Lakshmi Pulakat. Dept. of Biological Sciences, Bowling Green State University, Bowling Green OH 43403.

Biochemical analysis on the DNA content of *Azotobacter vinelandii* cells indicated that they contain about 80 copies of their chromosome per cell. In contrast, the fact that many recessive mutants can be isolated from *A. vinelandii* without the constraints expected for a cell that has 80 copies of its chromosome argued against this organism being highly polyploid. In an attempt to explain this apparent discrepancy, we have investigated the following: a) The segregation of a kanamycin resistant genetic marker under nonselective conditions in Azotobacter vinelandii. Plasmid DNA was used to introduce the kanamycin resistance gene onto the A. vinelandii chromosome at the nifY locus by homologous recombination. The transformants were identified from non-transformants with the aid of replica plating, and hence the colonies examined for segregation of the genetic marker were never subjected to kanamycin selection. In spite of growing the transformants in the absence of selection pressure, no segregant that lacked the kanamycin resistance gene was scored. These analyses suggested that the segregation of the kanamycin marker in *A. vinelandii* did not exhibit any constraints expected in a high polyploid bacterium. b) The number of copies of chromosome per *A. vinelandii* cell. We have developed a technique that we refer to as the "In vivo Method for Chromosome Counting." The salient feature of this technique is to introduce an identical genetic marker on the chromosome of the organism and also on an extrachromosomal element (plasmid) of known copy number as an indicator. We have used this technique successfully to estimate the chromosome copy number in *A. vinelandii*. The significance this new data on the ploidy nature of A. vinelandii will be discussed.

BOARD 27 MOLECULAR AND GENETIC ANALYSIS OF THE *RFB*-GENE CLUSTER FROM *AZOTOBACTER VINELANDII*. Bryan Hausman, Lakshmi Pulakat, Ryan Schreiner and Jeffrey Williamson, Nara Gavini, Dept. of Biological Sciences, Bowling Green State University, Bowling Green OH 43403.

We have identified the *rfbG* from a non-symbiotic and non-pathogenic soil bacterium, *Azotobacter vinelandii*. The nucleotide sequence analysis of the *rfbG* revealed an open reading frame that encodes a peptide of 360 amino acids. This deduced peptide shares 57% homology with the RfbG of *Synechocystis* and 47% homology with the RfbG of *Yersinia pseudotuberculosis*. The previously identified short-chain dehydrogenases/reductases family (SDR) signature sequence is conserved in the sequence of the RfbG of *A. vinelandii*. Southern blotting analysis of *A. vinelandii* chromosome by probed with 1.1kb *Psi*I DNA fragment corresponding to *rfbG* revealed that it is present as single copy on *A. vinelandii* chromosome. Disrupting the *rfbG* present on the chromosome of *A. vinelandii*, by insertion of kanamycin resistance marker via homologous recombination, resulted in drastic changes in the growth characteristics. The *rfbG*-negative *A. vinelandii* grown in liquid medium exhibited agglutination that is characteristic of *rfb* mutants of other bacteria, suggesting that we have cloned the functional copy of the *rfbG* of *A. vinelandii*.

BOARD 28 A POSSIBLE FUNCTION FOR THE *NifM* IN BIOLOGICAL NITROGEN FIXATION. Dieter Knowle, Ryan Schreiner, Tiffany Chandler, Ekem Efuet, Lakshmi Pulakat and Nara Gavini, Dept. of Biological Sciences, Bowling Green State University, Bowling Green OH 43403.

The nitrogenase is one of the intriguing, complex metalloenzymes and is composed of two separate proteins designated the Fe-protein and the MoFe protein. Since the numerous genes involved in the synthesis and assembly of this enzyme have already been cloned and sequenced, this enzyme is probably one of the first completely defined example of metalloproteins. In order to gain insight into the mechanism of the Fe-protein assembly process, we are investigating the role of the NifM protein in conferring stability and activity to the Fe-protein of *Azotobacter vinelandii*. However, the nature of such

a catalytic event is unclear. Our comparison studies indicated that one of the possible functions of the NifM protein is to assist in the proper folding of the Fe-protein by catalyzing the conformational interconversions by the cis/trans isomerization of the peptide bond N-terminal to the proline residues present in this peptide. We have constructed a plasmid that over expresses NifM in *E. coli* and by using standard protocols, we have been able to obtain pure NifM protein. We observed that this recombinant NifM exhibited peptidyl prolyl cis-trans isomerase activity when Succinyl-Ala-Phe-Pro-Phe-4- nitroanilide was used as a substrate. These results and their implications in the maturation and assembly of this metalloprotein will be discussed.

BOARD 29 STRUCTURE/FUNCTION OF THE Fe-PROTEIN OF NITROGENASE: ISOLATION OF *A. VINELANDII* DJ54 REVERTANTS. **Shi Lei, Lakshmi Pulakat and Nara Gavini, Dept. of Biological Sciences, Bowling Green State University, Bowling Green OH 43403.**

We have isolated a group of novel type of revertants that are capable of utilizing atmospheric nitrogen to support their growth. The unusual thing about these revertants is that they were isolated from the strain *A. vinelandii* DJ54, which contained a defined deletion in the *nifH* gene present on its chromosome. The strain *A. vinelandii* DJ54 is unable to grow on nitrogen free growth medium due to this deletion in the *nifH* gene. Spontaneous revertants were isolated by growing the strain *A. vinelandii* DJ54 on nitrogen free medium at 30°C for a period of 3 days. The revertants appeared at a frequency of $5x10^{-5}$-$1x10^{-4}$. PCR analysis of the chromosome isolated from *A. vinelandii* DJ54 revertants showed that they maintained the Δ *nifH* genotype of their parental strain. Further investigation by genetic and biochemical methods to understand the genetic basis for the nif$^+$ phenotype of *A. vinelandii* DJ54 revertants indicated that in these revertants, the *vnfH*, a *nifH* gene belonging to an alternative *nif* system is activated. This is because, even though the conventional *nifH* is deleted in the strain *A. vinelandii* DJ54, the *vnfH* and *anfH* are intact on the chromosome and are available to synthesize their corresponding Fe-protein upon demand. However, normally *vnfH* is not activated when Molybdenum is present in the growth medium. For nitrogen fixation to occur, the Fe-protein must functions as a one-electron donor to the MoFe-protein. This electron transfer is thermodynamically unfavorable and requires the hydrolysis of 2MgATP per electron transferred. Because of the ATP hydrolysis, this is a very specific reaction. Our studies suggest that in *A. vinelandii* DJ54 revertants, the *vnfH* is activated even in the presence Molybdenum in the growth medium and the *vnf* Fe protein is carrying out the functions of the conventional Fe-protein in these cells.

BOARD 30 MUTATIONAL AND BIOCHEMICAL ANALYSIS OF THE ChlL FROM *CHLAMYDOMONAS*. **Laura Sigworth, Ryan Schreiner, Lakshmi Pulakat and Nara Gavini. Department of Biological Sciences, Bowling Green State University. Bowling Green OH 43403.**

The product of the chlL gene is a protochlorophyllide reductase and shares significant homology to the consensus sequence of the nifH gene that encodes the Fe-protein component of nitrogenase. This homology is in the amino acid residues known to be important for the Fe-protein functions. These include: a). The cysteine ligands for the [4Fe-4S] cluster; b). Regions identified by cross-linking studies to be involved in binding to the MoFe-protein; c). The MgATP binding site and d). Regions involved in MgATP induced conformational change necessary for productive electron transfer to the MoFe-protein. The greatest conservation between the chlorophyll Fe-protein and the nitrogenase Fe-protein is found in the sites known to be for binding a [4Fe-4S] cluster. Our investigations are directed to understand the existence of mechanistic similarities between these two proteins. As a first step we have converted the conserved cysteine residues to serine by site-directed mutagenesis. These residues correspond to the cysteine residues in the Fe-protein which are shown to serve as ligands for the [4Fe-4S] cluster. Once the mutations were identified, the Chlamydomona s cells were transformed using the Particle Inflow Gun (PIG) transformation system. Our results show that as in the case of the Fe-protein, these cysteine residues serve as ligands for the [4Fe-4S] cluster in the ChlL. Moreover, both mutants, Cys95Ser and Cys129Ser lost the light-independent greening ability, further supporting that the critical role these amino acids play in structure/function of the ChlL and the Fe-protein.

BOARD 31 APPLICATION OF YEAST TWO-HYBRID SYSTEM IN ASSIGNING POSSIBLE ROLES FOR VARIOUS *nif*-GENES: GENETIC ANALYSIS ON THE INTERACTIONS OF NifW. **Sae-Hong Lee, Lakshmi Pulakat, Kenneth Parker, Stacie Mcgrew and Nara Gavini, Dept. of Biological Sciences, Bowling Green State University, Bowling Green OH 43403.**

Nitrogenase is composed of two separately purified proteins, both of which are extremely oxygen sensitive. The smaller of the two proteins, designated the Fe-protein, has a molecular weight of about 60,000 daltons and is a dimer of identical subunits encoded by the *nifH* gene. The larger of the two proteins, designated the MoFe-protein, has a molecular weight of 230,000 daltons. The MoFe-protein is a tetramer in its biologically active form and is composed of two identical halves, each containing an a-subunit and a b-subunit encoded by the *nifD* and *nifK* genes, respectively. Besidesthe structural genes of nitrogenase, there are a number of *nif*-specific genes and their protein products -twenty identified to date- that comprise a part of the *nif*-regulon. Eventhough experimental evidence suggests that these accessory proteins are required for nitrogenase activity, the exact roles played by many of these proteins in the functions of nitrogenase are unclear. Our studies were directed to understand the role of two *nif* accessory proteins, the NifW and the NifZ in the biological nitrogen fixation. To accomplish this, we have utilized a genetic method, the Yeast based Two-Hybrid protein-protein interaction assay. This analysis showed that the NifW could interact with itself to make a multimeric complex. In contrast, the NifZ could not interact with itself. However, the NifZ could interact with the NifW. Previously it was shown that mutating either the NifW or the NifZ have similar effects on the activity of nitrogenase. This observation indicated that both these proteins may exert their regulation on the nitrogenase by a common pathway. Furthermore, it was suggested that the NifW plays a role in the oxygen-protection of the MoFe-protein by direct physical interaction. Our observation that the NifW can interact with itself as well as with the NifZ, suggests that the NifW and the NifZ may form a higher order complex and such a complex may be needed to exert the effects of the NifW or the NifZ on the nitrogenase activity.

BOARD 32 POLYMORPHISMS IN HLA-DM REGULATORY SEQUENCES. **Albert R. Wheeler III, Andrew J. Fabich (Dr. Simon K. Lawrance), Otterbein College, Life Science Dept., Westerville OH 43081.**

The major histocompatibility complex (MHC) class II molecules are responsible for presenting foreign antigens, found in the extracellular fluid, to the immune system. Polymorphisms in HLA genes are significant in many autoimmune diseases. HLA-DM is an MHC class II-like molecule that catalyzes the removal of class II-associated invariant chain peptides (CLIP) and the binding of antigens to MHC class II molecules. The purpose of this research is to investigate the possibility of polymorphisms in the regulatory portion of the HLA-DM molecule. To conduct this investigation, DNA was isolated from ten volunteers. The HLA-DM regulatory sequences were amplified by polymerase chain reaction. The amplified products are currently being examined using the BESS T-Scan Mutation Detection and Localization procedure (Epicentre Technologies). This procedure functions by incorporating a limited amount of dUTP into the PCR product. The PCR product is then treated with Endonuclease IV and electrophoresed in a polyacrylamide gel. Shifts or changes in intensity of the banding pattern obtained indicate the location of polymorphic nucleotides. Polymorphisms detected may have significance for T cell development, antigen presentation, and autoimmune disease.

BOARD 33 THE EFFECTS OF VARYING DOSES OF ETHANOL IN A LEARNING TASK. **Jennifer C. Mutter, Cathy L. Pederson, Wittenberg University, Biology Dept., PO Box 720, Springfield OH 45501.**

The dose-dependent effects of ethanol as a function of time were studied on rats completing an alley maze. Sprague-Dawley rats were implanted with a stainless steel cannula in the third ventricle. After one week of recovery, animals were restricted in their food intake and trained to complete an alley maze. Training sessions continued until the rats could complete 80% of the trials in a prescribed time. Data were collected in a series of three runs. Each run consisted of consecutive days of training, baseline saline intracerebroventricular (ICV) injection, and experimental ICV injection with two minute absorption periods before the first time trial. Animals were given baseline injections of saline as a control for within rat variation. Rats were given an experimental dose of either saline, or a low (600 μM), medium (900 μM), or high (1200 μM) dose of ethanol. There were no significant differences in the maze times among the experimental groups. In addition, statistical analysis of covariance showed that there were no significant differences between the baseline and experimental days for each dose. The lack of significance may have been due to low ethanol concentrations or insufficient absorption time for ethanol. The lack of significant differences in trial times does not necessarily mean that there were no effects of ethanol.

BOARD 34 COLLECTION AND ANALYSIS OF SELECTED MINERALS FOUND IN SWEAT, PERSPIRED BY WRESTLERS DURING EXERCISE. **Cato E. Coleman III (Dr. Spillman), 209 Hahne Hall, Miami University, 5357 Bonham Rd., Oxford OH 45056.**

Wrestlers lose several pounds of sweat per exercise session. Therefore, they will be used in this research. The hypothesis it that this research will conclude selected body areas perspire different amounts of minerals: By determining the amount of minerals perspired many doors of opportunity may be opened and create a new hope for individuals suffering from mineral deficiencies. By knowing the amounts of minerals lost through perspiration, it will be possible to alter diets of patients, athletes, accident victims, birthing mothers, and mineral deficient individuals in order to help improve and or maintain homeostasis of their body. Methods used in research will include body fat percentage analysis, twenty-four hour diet record, twenty minutes of aerobic exercise, and sweat collection via glass funnel into a mineral free vial. There will be no control over mineral intake of subjects prior to sweat collection because general results are desired, and controlled inter-body environment results are not the objective. Other materials used include: protective gloves, weighing scales, glass storage vials, and skin calipers.

BOARD 35 SELF-REPORTS OF SEXUAL, PHYSICAL AND PSYCHOLOGICAL ABUSE IN THE FIRST-EPISODE PSYCHOSIS POPULATION. **Michelle A. Stahl, 380 Oregon Street Apt. 106, Cincinnati OH 45202.**

The data used for this analysis were obtained from the University of Cincinnati First-Episode Psychosis Project. The study explores, using post-hoc methods, sexual, physical, and psychological abuse as reported by patients that experienced a psychotic break and had no previous psychiatric admission. The purpose of this study is to determine the frequency with which abuse occurred among participants to ascertain the possibility that abuse contributes to First Episode-Psychosis. It was hypothesized that patients in this population would report abuse in higher frequency as compared to the normal population. 2.) 82 males and 75 females who had been diagnosed with schizophrenia (n=30), manic depression (n=122), psychotic disorder (n=4), or delusional disorder (n=1) were given the Traumatic events Screening Inventory (TESI). The TESI was used to determine reported abuse and was derived from the DSM-III-R. 3.) Preliminary data analysis suggests that 73% of the patients having a diagnosis of schizophrenia along with 77% of the patients diagnosed with manic depression reported one or more abuses (sexual, physical, and psychological) on the TESI. Descriptive statistics will be done on populations whose n>4. The incidence of reported abuse among these patients is substantially higher than that reported in the general population. 4.)The preliminary results found in this analysis are striking and suggest that psychiatric institutions need to explore patient histories more thoroughly.

BOARD 36 EFFECTS OF HERBAL PHEN-FEN ON THE RISK OF MYOCARDIAL INFARCTION. KEVIN A. KOONS, TRAVIS R. TANNER, (KATHRYN T. KNECHT), RAABE COLLEGE OF PHARMACY, OHIO NORTHERN UNIVERSITY, ADA OH 45810.

Herbal Phen-fen is an herbal supplement that claims to be a safe method of weight-loss. The main ingredient in herbal phen-fen is ephedrine, an amphetamine like substance, also known as Ma Huang extract. Recent studies show ephedrine may increase the risk of myocardial infarction (MI). The herbal phen-fen being used in this study is a combination of ephedrine and St. John's Wort (hypericin extract). St. John's Wort in recent studies has been shown to inhibit mono amine oxidase which may potentiate the negative effects of ephedrine on the heart. We are administering herbal phen-fen to white mice and will analyze its effects on the cardiac enzymes AST, CPK(MB), and LDH. All three enzymes are shown to increase significantly after a myocardial infarction. Preliminary studies have shown a significant increase of cardiac enzymes in white mice after dosages of 1.5mg/kg of amphetamine, suggesting significant damage to the heart. Amphetamine causes effects very similar to that of ephedrine including vasoconstriction, positive inotropic, and positive chronotropic effects on the heart. The effects of Herbal Phen-fen will be compared to see if the herbal combination increases the chance for a myocardial infarction as compared to ephedrine alone or St. John's wort alone. Another Herbal Phen-fen combination replaces St. John's Wort with Ginseng. Ginseng in recent studies has been shown to act as an antioxidant and reduce damage to the heart after an MI. Weight loss will also be monitored in the mice to determine the value of the herbal supplement as a weight-loss agent, and measure the potential risks against the benefits.

BOARD 37 EFFECT OF DIRECT PRIMING OF TRAIT LABELS ON CHILDREN'S PERCEPTIONS OF AMBIGUOUS BEHAVIOR. TERRI LEE KASMOCH (DR. FRANK BERNIERI) UNIVERSITY OF TOLEDO, BANCROFT ST., UNIVERSITY HALL RM. 6524, TOLEDO OH 43606.

Do labels bias children's perceptions of other children? An experiment compared labeling biases in children aged 7-10 years. One hundred twenty-eight third and fourth grade children (67 boys and 61 girls) viewed a five minute audio-video tape of a 7 year old girl interacting in a first grade classroom. After viewing the brief video segment, children were asked to rate the target child according to 4 school rules, then on desirability of target as a playmate. Preliminary analyses revealed a main effect for labeling on children's reports of "desirability" as a playmate for the target child ($F(2, 122)=5.472$, $p<.01$). Females were more likely than males to desire the target girl as a playmate when labeled as "smart" (M=.750 for females and M=.300 for males). The results demonstrate that girls in this age group respond more than boys to both negative and positive labels. Both boys and girls in the no label condition rated the desirability of the target child as a playmate similarly (M=.316 for boys and M=.353 for girls) which indicates that the own-sex favoritism phenomenon was not at work in this study.

BOARD 38 INFLUENCE OF PCB 77 ON THYROID STATUS, BRAIN CHOLINE ACETYLTRANSFERASE ACTIVITY, AND MORRIS WATER MAZE PERFORMANCE. M.B. FERLIC, T. PROVOST, K. KORPITA, L.M. JUAREZ DE KU, AND L.A. MESERVE, DEPT. OF BIOLOGICAL SCIENCES, BGSU, BOWLING GREEN OH 43403-0212.

Previous studies found a mixture of polychlorinated biphenyl, Aroclor 1254 (12.5 ppm), to depress thyroid status, choline acetyltransferase (ChAT) activity, and behavioral development. The present study examined the influence of a single coplanar PCB molecule (3,3',4,4' tetrachlorobiphenyl, PCB77) on the same measures. It was anticipated that the effect of the single molecule would be less pronounced than the mixture. Female Sprague Dawley rats were fed 12.5 ppm of PCB77 in standard rat chow beginning on the first day of pregnancy. Pups were decapitated on day 30, drained of trunk blood, and dissected. Serum was analyzed by RIA for concen- trations of thyroid hormone (T3 and T4). ChAT activity was radiometrically measured in hippocampus, basal forebrain, and cerebral cortex samples. To determine the effect of PCB77 on spatial learning and memory, test rats were subjected to 10 trials in the Morris Water Maze on days 25-29. Preliminary data suggest that exposure to PCB77 causes a significant depression of serum T3 concentration. Hippocampal and basal forebrain ChAT activity and rate of learning the maze were not altered by this level of PCB77. This suggests that the PCB mixture has more profound effects than the single molecule.

BOARD 39 DETERMINING PESTICIDE TOLERANCES FOR THE STRAWBERRY SAP BEETLE (*STELIDOTA GEMINATA*) AND ITS PARASITE (*BRACHYSERPHUS ABRUPTUS*), ROGER N. WILLIAMS, DAN S. FICKLE AND TALAAT ABU HASHISH, DEPT. OF ENTOMOLOGY, OARDC/ OSU,1680 MADISON AVE., WOOSTER, OHIO 44691-4096.

This study determined the lethal dosage(LD) of several commercial pesticides for the strawberry sap beetle(SSB),*Stelidota geminata* Say and its parasite, *Brachyserphus abruptus* (Say). Efficacy data was also obtained on the tarnished plant bug (TPB), *Lygus lineolaris* (P. de B.)and the meadow spittlebug (MSB), *Philaenus spumarius* (L.). Pesticides utilized were the standard Thiodan (endosulfan), Guthion (azinophosmethyl), Danitol (fenpropathrin) and Brigade (bifenthrin). Bioassays determined lethal dosage (LD) amounts for the SSB, dried fruit beetle (DFB), *Carpophilus hemipterus* (Say) and the nitidulid parasite, *B. abruptus*. Field evaluations indicated that all treatments were effective in controlling MSB and TPB. The higher rate of bifenthrin provided the best control. The lab bioassay produced similar results against the adult TPB and MSB. However, control of the SSB differed slightly. Endosulfan had little effect on the sap beetles while bifenthrin and azinphosmethyl produced excellent control of the SSB.

SESSION 26

PRE-COLLEGE POSTER SESSION

1:00- 2:15 PM

SATURDAY, APRIL 4, 1998

JOHNSTON HALL COMMONS

BOARD 01 A COMPARISON OF TWO MANEUVERS PILOTS CAN USE TO TOLERATE G-FORCES. STEPHEN L. WILSON, 6500 ATTERBURY CT, DAYTON OH 45459 (WILLIAM C.M. WILSON, M.D., SUPERVISOR).

Fighter pilots face circulatory problems when exposed to extreme gravitational forces possibly leading to blackouts and loss of consciousness. To counteract this, the effectiveness of the L-I and Q-G straining maneuvers in altering systolic blood pressure, oxygen saturation and pulse rate were tested with and without an inflated anti-G suit to see which of the two maneuvers could better provide protection for pilots. After informed consent, four healthy 14 year old male subjects were taught the two maneuvers, and measurements of oxygen saturation, systolic blood pressure and pulse were taken. The maneuvers were performed for 30 seconds and readings were taken and compared at 0, 15, 30 seconds, and 30 seconds after the maneuver was completed. The Q-G maneuver, it was discovered, was not as effective as the L-1 maneuver in raising systolic blood pressure, but the Q-G produced a lower pulse rate than the L-1. Inflating the G-suit initially raised systolic blood pressure at rest, but as the maneuvers progressed, the inflated G-suit produced a lower systolic blood pressure than when the maneuvers were performed without the G-suit inflated. The Q-G maneuver is not as effective as the L-1 in raising systolic blood pressure and pulse and may have a negative effect on oxygen saturation of blood. The G-suit does raise systolic blood pressure at rest but would appear to be less important than the anti-G maneuvers themselves in protecting pilots against the negative effects of +Gz acceleration.

BOARD 02 INTERACTIONS OF THE NEUROPEPTIDE CORTICOTROPIN RELEASING FACTOR (CRF) AND ITS EFFECT ON NEURONAL ACTIVITY. CONSTANCE V. TAYLOR, 1300 WINDHAM RD, COLUMBUS OH 43220.

Axons derived from neurons located in different brainstem nuclei provide input to the cerebellum, a part of the brain involved in the coordination and control of movement. These inputs contain different neurochemicals (such as amino acids, monoamines and peptides). Some systems contain more than one neuroactive substance, such as combinations of amino acids and peptides, or peptides and monoamines. Earlier studies have shown that peptides (such as CRF) modulate the activity of neurons within the cerebellum. This study identifies the neurons that give rise to the CRF projection to the cerebellum and is a preliminary step to identifying the brainstem neurons which activate the axons that contain this CRF peptide. Data has been obtained in adult male rats. Fluorescent microspheres were injected into the cerebellum and transported to neurons in the brainstem that had axons in the injection site. The same sections were processed for visualization of CRF. Neurons that contained fluorescent microshperes and were positive for CRF were identified as being the source of this peptide in cerebellar circuits. The neuron location was photographed and plotted on drawings of the brainstem. Continuing research shows these cells to be localized to specific nuclei in the brainstem including the inferior olive, lateral reticular nucleus, perihypoglossal nucleus, and the reticular formation. These experiments are providing an anatomical substrate for proposed physiological studies, which will determine how inputs from axons alter activity in the cerebellum.

BOARD 03 EFFECT OF HERBAL PREPARATIONS ON XENOBIOTIC HEPATOTOXICITY AND METABOLISM. MATTHEW GERTEN, CHARLES D. RABUCK, (KATHRYN T. KNECHT, OHIO NORTHERN UNIVERSITY), 12737 RD. R 11, COLUMBUS GROVE OH 45830.

Self-medication with a wide range of herbs is a growing trend in the United States. A number of herbs purportedly "protect" or "cleanse" the liver, and at least one herb, milk thistle (*Silybum marianum*), has indeed been shown to have hepatoprotective effect. However, the effects of other herbals are not as well substantiated. In addition, the possible interaction of these herbs with concurrently administered pharmaceuticals has not been extensively investigated. The purpose of these studies is to determine if commercially available preparations of the herbs burdock (*Arctium lappa*), dandelion root (*Taraxacum officinale*), milk thistle, and red clover (*Trifolium pratense*) are able to protect the liver of mice from damage produced by carbon tetrachloride (CCl_4) or acetaminophen. Prior oral dosing with milk thistle, burdock, or clover decreased serum ALT in deermice (*Peromyscus maniculatus*) at 3, 8, and 12 hours after i.p. CCl_4 administration, while dandelion had only minimal effect. Milk thistle also appeared to protect against acetamnophen administration. This protection may be related to an inhibition of the enzymes that metabolize CCl_4 and acetaminophen to toxic metabolites, since these herbs also decreased the (metabolic) clearance of CCl_4 as measured by GC analysis of samples of mouse breath.

BOARD 04 WHAT ARE THE EFFECTS OF WATER TEMPERATURE ON THE GROWTH OF SNAPDRAGONS? ELIAS J. SALIBA. 6131 CORSICA DRIVE, HUBER HEIGHTS OH 45424.

The experiment tested how water temperature affected the growth of *Antirrhinum majus* (snapdragons). The purpose of this experiment was to see which temperature best improved the growth of snapdragons. Snapdragons evolved on the foothills of the Rocky and Appalachian

Mountains. The white flowers prove that the plants tested evolved on the Appalachian foothills. There were four test groups of five plants each. Group D received 30°C water, Group C 20°C water, Group B 5°C water, Group A -10°C ice cubes. The test ran from Oct. 9 to Jan. 2. The plants were watered every four to five days. Every other watering, the height was measured, the number of branches over 10 cm. were counted, and the number of flowers were counted. The plants receiving the 30°C water grew the tallest. However, the plants getting the 5°C water grew more branches and flowers than any other group. The group receiving the 30°C did not grow any flowers. The hypothesis is that the 5°C water improved the growth of the snapdragons because it was closest to the temperature of the water that the snapdragons absorbed when they were growing on the foothills of the Appalachian Mountains during springtime. This, along with temperatures close to springtime in the Appalachians, caused the snapdragons to go into its springtime growth.

BOARD 05 ANALYSIS OF BROWNFIELD BUILDING CONTAMINATION IN THE CLEVELAND AREA. **Lavanya Kondapalli, 17396 Olde Surrey Ct., Strongsville OH 44136.**

Brownfields are defined by the Environmental Protection Agency as "abandoned, idled, or under-used industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contamination". Sites of this caliber plague a vast expanse of the Cleveland area, as well as other cities throughout the country. The focus of this research was to determine the effect that an industrial environment has had on the masonry used in structural walls and floors from various brownfield sites in Cleveland. The hypothesis was: Due to the porous nature of masonry, heavy metal contaminants settle into the structural materials of industrial sites over time. The portion of a masonry sample that was directly exposed to industrial activity will show the highest levels of contamination and successive sections of the sample will show a steady decrease in contaminant levels. Initially each masonry sample was sliced to allow for comparisons in levels of contamination, crushed, and sieved. Extractions were performed in order to render metals that had been previously adsorbed by the samples. The extractions were filtered and extractants were analyzed for percent hydrogen and heavy metals: cadmium, chromium, copper, iron, lead, and zinc using an atomic absorption spectrophotometer instrument. Fourteen samples were tested. Sample C had the highest concentration of chromium and iron, Sample D of lead, and Sample G of copper. All of these samples were taken within a one mile radius of LTV Steel. Sample I had the highest concentration of cadmium and Sample J of zinc. These sample were taken from different areas of Cleveland Galvanizing Company. The hypothesis was supported by these findings. However, variations in contamination levels of different sections of a sample were not seen.

BOARD 06 UNIQUE FIBER ADDITIVES USED TO MAKE RECYCLED PAPER STRONGER. **Jade C. Brimstein, 8640 SR 124, Latham OH 45646.**

The object of this research was to investigate the effects of unique fibers in conjunction with recycled newsprint to create a stronger more efficient sheet of paper. My hypothesis is that of the five materials tested, (hemp, hesperaloe, kenaf, milkweed, and algae) the paper made of hemp and newsprint will have the strongest TAPPI Tear resistance and the strongest Wax Pick resistance. This was tested as follows: I first pulped 25g. fiber and 25g. newsprint, the pulped materials were poured into a tub containing warm water, a hand mold was taken through the mixture until a sheet formed. The sheets were removed from the mold by pressing it with a sheet of cotton blotter paper, the recycled paper and additive sheet was then dried in a convential oven until the sheet pulled from the blotter paper. The sheets were then cut in three sections, the middle section was tested on the Elemndorf Tappi Tear Tester, the edge sheets were compared and the nicest of the two were tested using the Wax Pick Test. The results of the tests for each of the five batches of paper were recorded then averaged and compared. The tests showed that the paper made of hemp and newsprint had the strongest TAPPI Tear average and the paper made of hesperaloe and newsprint had the strongest Wax Pick average.

BOARD 07 DURING WHICH SEASON DO LOCAL CREEKS CONTRIBUTE THE MOST *E. COLI* TO THE OHIO RIVER? **Anthony J. Paragon (Mrs. Jayshree Shah), 9741 SR 7, Proctorville OH 45669.**

This project seeks to discover in which season our local creeks contribute the most *Escherichia coli* to the Ohio River. My previous study in April 1997 supported the premise that the local creeks did contribute to the *E. coli* count in the Ohio River. This experiment hypothesizes that the summer season will produce the highest amount of *E. coli.* Seven samples, five from local creeks and two from the Ohio River were taken. Of the two Ohio River samples, one was collected from the Ohio River above the Two Mile creek (Sample 1), and the other was collected from the Ohio River below the Symmes creek (Sample 7). From the Magellan GPS 2000 unit, the longitude and latitude coordinates are as follows: Sample 1-38°31' 35N 82°18' 09W, Two Mile Creek-38°30' 28N 82°18' 27W, McCall Creek-38°29' 25N 82°18' 46W, Big Paddy Creek-38°26' 23N 82°22' 08W, Indian Guyan-38°26' 16N 82°22' 15W, Symmes Creek-38°25' 50N 82°27' 04W, Sample 7-38°25' 39N 82°27' 03W. The season with the overall highest amount of *Escherichia coli* added to the Ohio River is the season contributing the most E. coli. Five separate collections were made, averaged, and compared during each season. Procedures from the *Standard Methods for Examination of Water and Waste Water* were used in sample collection and the chromogenic substrate coliform tests were performed. Initial observations indicates that the summer season has produced the lowest addition of *Escherichia coli* to the Ohio River to date.

BOARD 08 SHIELDING RADIATION. **Ryan P. Sullivan, 148 Woodland Way, Chillicothe OH 45601.**

Radiation in several forms and from several sources is all around us. This research was conducted to determine how effective common household materials were in shielding radiation emissions. The hypothesis was common household materials could be used as an effective shield against low level radiation emissions. To determine if the material was an effective shield against radiation, it had to block at least 90% of the emission. Using a Geiger Counter to detect emission levels, several types of common household materials were tested. Each item was exposed to the radiation source. The highest reading recorded during that period was selected as the test result and was recorded on the log. Before each test, an unshielded reading was taken and used as a control. Fifteen different materials were tested, 5 that were 6.4mm thick, 5 that were 3.2mm thick, and 5 that were 1.0mm thick. The 6.4mm thick materials included ceramic tile, Formica, oak, foam rubber, and Styrofoam. The 3.2mm thick materials included an asphalt shingle, glass, cardboard, Plexiglas, and vinyl. The 1.0mm thick materials included aluminum, cloth, plastic, wax paper, and bond paper. Each material was tested at 0, 5, and 10 cm from the radiation source. Each material was also tested at double and triple the original thickness. The entire test was repeated one week after the original test in order to verify the original test results. A few materials shielded beyond the 90% threshold, which reinforced the hypothesis. Triple thick ceramic tile shielded 94% of the emission and was the most effective shielding material. Density of the material, rather than thickness, proved to have a larger impact on a materials ability to act as a shield. Layering the material also enhanced the materials ability to shield radiation.

BOARD 09 EQUINE DNA LIBRARY. **Greg S. Maeder, Rachael E. Margo, (Simon K. Lawrance, Ph.D.), 633 Timberlake Dr., Westerville OH 43081.**

The objective of this investigation is the creation of an equine DNA library. This library will enable students to explore specific sites within the equine genome and to contribute to the equine genome project. The results of the study to date include the purification of high molecular weight DNA from the white blood cells of fresh horse blood, the partial digestion of the DNA into restriction fragments with the restriction endonuclease Sau 3AI and estimation of the molecular weight of the fragmented DNA by gel electrophoresis. The plasmid vector pKS+ (Stratagene) was cut with Bam HI and dephosphorylated with shrimp alkaline phosphatase. With DNA ligase, the partially Sau3A digested equine DNA was inserted into the Bam HI cut dephosphorylated pKS+ plasmid. The resulting recombinant plasmids were transformed into competent *E. coli* cells and grown on agar plates containing antibiotic. A color selection test with X-gal was employed to confirm the presence of the DNA inserts. The recombinant plasmids are currently being investigated further to identify the equine DNA sequences they contain.

BOARD 10 AGE-RELATED CHANGES IN BRAIN RESPIRATORY ENZYMES FOR NORMOTENSIVE AND HYPERTENSIVE RATS: A HISTOCHEMICAL STUDY. **Osmond C. Wu, 3945 Lytham Ct., Upper Arlington OH 43220.**

Dramatic changes in the activity of mitochondrial energy metabolism have been identified in a number of species, including human beings, during the fetal/neonatal transition. Precocial species, such as the guinea pig, achieve greater neurologic maturity prior to birth. These have been found to undergo this transition at earlier ages than altricial species such as rat. Successful development and maturation of the central nervous system is therefore critically dependent upon efficient perinatal amplification of oxidative mitochondrial energy metabolism. Modification of this developmental program may render the nervous system increasingly vulnerable to a variety of insults. With evidence for regional differences in the vulnerability to metabolic compromise, studies of metabolic development must employ anatomically precise methods. The current study examines the ontogeny of the electron transport chain (ETC) in stroke-prone spontaneously hypertensive (SHRsp) and normotensive Wistar Kyoto (WKY) rats to determine whether alteration in the normal development of mitochondrial energy metabolism contribute to enhanced stroke risk. Histochemical assays have been used to study Complex II (succinate dehydrogenase) and Complex IV (cytochrome oxidase) of the ETC. Data were gathered from five brain regions. Preliminary results show similar developmental profiles in all structures for both strains in the two assays. Following an interval of increasing enzyme activity, a plateau is reached at approximately 30 days and maintained into adulthood. For succinate dehydrogenase (SDH), the developmental increase for the two strains can be superimposed. In contrast, for cytochrome oxidase (COX), while the profiles are similar, the WKY strain achieves a greater value. Reduced efficiency of ATP synthesis secondary to lower COX activity may contribute to increased stroke risk. Statistical analysis shows that a significant augmentation of mitochondrial energy metabolism occurs during the postnatal period and is crucial to neuronal development and maturation. Alternation in the amplification of COX activity in the SHRsp strain could reduce the efficiency of ATP synthesis and render neurons selectively vulnerable to ischemia.

BOARD 11 BACTERIAL RESISTANCE TO ANTIBIOTICS. **Luke T. Skidmore, 400 Lake Ave., West Mansfield, OH 43358.**

Bacteria were placed in an environment of increasing levels of antibiotics, to produce resistant bacteria. That resistant bacteria was then tested for cross-resistance and dependence. Cross-resistance to kanamycin was observed in streptomycin resistant bacteria. There was no dependence recorded. The mechanism of resistance that was developed was not of the dependence phenotype. Six cultures of *E. coli,* ATTC2507, were subcultured with low levels of varying antibiotics chosen randomly. The control was strains for the six antibiotics that will increase in level until 25mL of antibiotic is obtained. This showed that a multiple drug treatment regime inhibited resistance development.

BOARD 12 SUBLETHAL INJURY OF MICROORGANISMS. **Sarah R. Wyse, 13985-2230, West Unity OH 43570.**

Recently, much attention has been given to heat treatments in the processing of foods and other products susceptible to microbial attack. Heat and other physical treatments do not necessarily kill all microbial cells but may only damage them. This type of injury has been termed sublethal injury. The purpose of this project was to determine which food processing procedure,

heating or freezing, would be the most damaging to bacterial cells and which treatment would permit cells to repair after refrigerated storage. The two hypotheses were that the heat treatment would be the most damaging to the bacterial cells and that the freezing treatment would permit the cells to repair after refrigerated storage. Different concentrations of Escherichia coli were tested in milk and saline with a heat and freeze treatment. Colony forming units were counted for the results. The results of each hypothesis proved to be correct. The saline freeze group had 5, 385 more CFUs than the saline heat group. The milk 2 freeze group had 12, 245 more CFUs than milk 2 heat group. The milk 4 freeze group had 8, 060 more CFUs than the milk 4 heat group. ANOVA results showed a significant difference, $p < .05$, between the heat and freeze treatments. Some additional trends were also noted. A milk 2 group took longer to heat to 60 C than a saline 2 group, and the lower the E. coli content of a milk group, the longer it took to reach 60 C.

BOARD 13 POSSIBLE USES FOR INDUSTRIAL WASTES AS ALTERNATIVE INSULATIONS. **Matthew E. Mowrer, 67610 Airport Rd., St. Clairsville OH 43950.**

The purpose of this research is to determine if there is a practical application of several industrial wastes as thermal insulation. Selected were fly ash, the remaining ash of burnt coal; a dolomite/sulfur dioxide compound commonly called "scrubber sludge"; recycled rubber and a fly ash/rubber mixture. To determine the efficiency of each, double-walled testing chambers were built. Each chamber consists of a six-inch cube in which is suspended a four-inch cube equally spaced from all the walls of the larger cube. In the four-inch cube a light bulb acts as a heat source. The cavity formed between the walls of the cubes is filled with the material to be tested. As the heat source warms the inner cube to a thermostatically controlled 37°C (98.6°F) the heat energy flows toward the outer wall of the chamber. The insulating material restricts this movement. The less restrictive the material, the more the heat source is on, maintaining the set temperature, and using energy, which is measured in Watt-Seconds. The efficiency of each material is then calculated by comparing the energy used by the control chamber over a set amount of time to the energy consumed by the individual testing chamber in the same amount of time. After several test sequences, the fly ash has shown to be the most efficient of the materials tested.

BOARD 14 WHAT ARE FACTORS THAT AFFECT COLIFORM GROWTH OF BIOFILM IN A MUNICIPAL WATER LINE? **Erin F. Schlegel, 1900 Atwood Terrace, Coshocton OH 43812.**

The objective of this project was to determine if the potential hazard of biofilm in dental unit water lines truly exits or is just a false fear to force uninformed dentists to pay for unneeded equipment. If chlorine is an effective disinfectant, then the factors that may affect coliform growth of biofilm (such as diameter and type of tube, contamination of water source, the temperature of water or medium, and the length of time in the tube) should not be significant. Eight different water sources were obtained: Evian (control) lake water, well, Brita, municipal, dental handpiece, dental cuspidor, and dental water syringe. These samples were tested with 4 different groups of experiments: Beakman's World, Coshocton County Memorial Hospital Memorial (CCMH) test #1 (without refrigeration), Carolina Biological and CCMH test#2 with refrigeration. Results showed that bacteria grow in all waters including the control. In conclusion, chlorine is an effective disinfectant that helps to eliminate some but not all harmful biological contaminates. Test demonstrated that variables (how the sample was gathered, temperature, time, growth media, light, and how the plate count was determined) do effect the results.

BOARD 15 THE EFFECT OF LOW TEMPERATURES ON ARTHROPODS. **Caleb R. Slemmons, 704 E. Columbus Ave., Bellefontaine OH 43311.**

A number of factors play important roles in an organisms ability to overwinter, these factors can include supercooling, entrance into diapause, and the production of cryoprotectants. The ability to cold-harden is required for overwintering (Lee, 1989). This research was directed at looking at how temperatures affect respiration rate, by employing the use of micro-respirometers, and the difference of the rate between two species of Arthropods being studied which include the common species of pillbug and centipede. In addition, cryoprotectants,if any, produced are being identified and quantified, through a glycerol assay, when the organisms are exposed to varying temperatures. Overall, the methods of overwintering will be contrasted and compared between the species. Preliminary data shows that the oxygen consumption rate is greatly depressed at 5(C in comparison to higher testing temperatures, and there was no significant difference between the species. Data also shows that glycerol is produced by the centipede in response to low temperature. No prior winter biological research has been carried out on these species examined in this study.

BOARD 16 THE TRUE COMPLEXITY OF THE COCKROACH IMMUNE RESPONSE **Ryan A. Grimes, PO Box 309, West Unity OH 43570.**

The purpose of this experiment was to determine if an intricate immune system in cockroaches could explain the constant reports of failing insecticides in today's environment. Three hundred American cockroaches were divided into experimental groups that were injected with inactivated honey bee venom in a Tris Buffered Saline solution, and controls that were injected only with the TBS solution. Two immunizations were administered, and then a final challenge of active venom was administered to all groups to find if the experimental groups formed any immune responses to the venom. The hypothesis in the project was that the rate of survival would be dramatically higher in the experimental groups than the controls. Also, that the percentage of female survivors would be higher than the males. The results obtained from testing showed the male control group to have only a 30% survival rate compared to a 60% rate for the female controls. Both male and female experimental groups had higher survival rates than the controls (67%-male, 87%-female). A chi-square analysis showed a significant increase in the survival rate of the experimental groups ($p < .05$). The results of this experiment indicate a uniquely complex immune response in cockroaches. This knowledge may prove to be beneficial to medical research in areas such as protein synthesis for the treatment of disease.

BOARD 17 THE EFFECT OF NUTRITION ON GROWTH RATE. **Laura M. Mahan, 704 E. Church St., West Unity, OH 43570.**

The purpose of this project was to investigate nutrition and its effect on health. The hypothesis for this project was that the group of mice that were fed a diet of only vegetables and protein would have a higher growth rate than the mice whose diet consisted of either store bought mice food (control), meat, vegetables, or meat and vegetables both. The reason for this hypothesis is that vegetarian diets are believed to be healthier than diets with meat in them. The experiment included two procedures. The first of these was the procedure for feeding the mice. On a daily basis, each group of mice were fed 35 grams of their specific diet. The second procedure was for weighing the mice. First, the experimenter took the mice out of the cage and put them into a paper sack. The sack was put on the scale and a measurement was taken. This was done three times for accuracy. This was repeated for the other groups of mice every week for a total of five weighings. The initial weighing occurred when the twenty-four mice were three weeks old. In doing this experiment the hypothesis was proven correct. The meat group gained 32 grams.The meat and vegetable group gained 41 grams.The control group gained 51 grams. The vegetable group gained 54.5 grams. The vegetable group did gain the most weight.

BOARD 18 COMPARISON OF SPECIES IN REGENERATED PLANARIA'S MEMORY **Kim M. Sattison, 22908 CR M, West Unity OH 43570.**

This experiment on memory retention in regenerated planaria used brown planaria and their regenerated parts, the head and the tail. The hypothesis was that the species of brown regenerated planaria would require the same amount of time to learn from the trained parent planaria as black regenerated planaria took to learn from the trained black planaria. During the weeks of experimentation the planaria were separated into a left and right bias group. Each planaria was trained to go the direction opposite the bias. The planaria were considered to be trained when they went 90% of the time in the correct direction. Next the planaria were cut just below the feeding tube. Once heads and tails were fully regenerated they were trained to go in the same direction as the parent. The hypothesis was proven correct. The average for original planaria being trained to go right was 67 initial trials and the average going left was 54 initial trials. The final results were the averages of the regenerated tails going to the right with 34 initial trials and 20 initial trials for the heads to be trained. Going to the left the average for the heads was 20 initial trials and the average for the tails was 27 initial trials. Through ANOVA it was statistically proven that there was a significant decrease in training trials ($p < .001$). The comparison of these results to the black planaria showed no significant difference between the two species of planaria in their memory retention rates.

BOARD 19 THE REGENERATION OF *LUMBRICULUS VARIEGATUS*. **Alyson D. Bradley, 3421 Twp. Rd. 165, West Liberty OH 43357**

Lumbriculus variegatus has become a model for regeneration. This segmented aquatic worm live throughout the world in wet, marsh habitats where they reproduce both sexually and asexually. In previous research it was found that after the lose of the anterior end an eight head segment regenerated. The purpose of this study is to find and identify the proteins involved in the regeneration of the eight head segments. After running an electrophoresis polyacriylamide denaturing gradient gel, differences in banding between the regenerating and non regenerating heads were found. These differences were then run again with a higher percentage of polyacrylamide to differentiate the banding with more clarity. In the regenerating sample one band was prevalent that was absent in the non-regenerating sample. Additionally, one band was absent in the regenerating sample that appeared in the non-regenerating sample. These differences can then be used to do future research. mRNA isolated from regenerating and non regenerating heads will be used to build a cDNA library. The cDNA library can be searched to identify the proteins of interest. This work should lead to a better understanding of gene regulation during regeneration.

BOARD 20 TRAINING ORIENTAL CHICKENS. **Meagan A. Carpenter, 60941 Warner Dr., Barnesville, OH 43713-9662.**

The purpose of this research project was to determine which breed of chicken would learn tricks the fastest. Three chickens (two roosters and one hen) were tested for each breed: Crested Polish, White Faced Black Spanish, Black-Tailed White Japanese, Chinese Silkies, Belgian D'Anvers, German Silver Spangled Hamburgs, and Asian Cochins. The chickens were full grown and untamed when purchased. They were from similar backgrounds (previously used for showing purposes; well cared for, but never had extensive personal contact with any human). The learning abilities of males and females of the same breed and of different breeds were also observed. Another question was what type of music would be the favorite of the flock and if music can stimulate egg production. The chickens were tested by being taught to sit and ride quietly in a toy school bus, to play the piano, and to ice skate. They were rewarded with treats of food at the end of each day, regardless of their performance. Their tolerance was tested by dressing them in special outfits and using them as part of an illustrated talk in order to educate people about poultry. They were also part of a pet therapy program for the elderly. The conclusion was that after one hundred nineteen days, hens were tamer than roosters; however, the Polish rooster was the smartest.

BOARD 21 THE EFFECT OF HARD BISCUITS ON CANINE SUPRAGINGIVAL PLAQUE. **Melissa O'Brien, 520 Gemini Dr., Marion OH 43302.**

The purpose of this experiment is to determine the effect of hard biscuits on canine supragingival plaque. The mechanical action of hard biscuits should reduce the amount of bacteria found on the surface of the tooth. Using sterile petri dishes set with nutrient agar, saliva samples taken from the right upper fourth premolar and the lower left fourth premolar from each of five dogs of different breeds were used to contaminate. Each dog was then fed one Milkbone™ dog biscuit and the sample process was repeated. The method was continued for seven

consecutive days. After three days, using a grid with a microscope for consistent location,the number of bacteria was counted and recorded for each sample. Overall, the range of the bacteria count was 7-38. The difference in the before and after biscuit samples ranged from 0-6. In a few samples, the count showed an increase in bacteria, but the amount of bacteria found decreased very slightly but erratically in rest samples. In conclusion, it was found that the mechanical abrasion by the hard biscuit upon the surface supragingival plaque on the canine teeth caused slightly less bacteria growth.

SESSION 27

Poster Session

2:45 - 4:45 PM

Saturday, April 4, 1998

Johnston Hall Commons

BOARD 01 WHITE WHEAT: A NEW CROP FOR OHIO FARMERS, **Steven C. Prochaska, Ohio State University Extension, 117 E. Mansfield St., Bucyrus OH 44820.**

To address the issues of farm profitability, crop biodiversity, and environmental protection, white wheat production (a new crop for Ohio farmers) was studied. The northwest region of Ohio is noted for its production of high quality soft red winter wheat. Red wheat grown for grain only is not as profitable as alternative crops (corn and soybeans) and thus acreage shifts to other crops are likely. Further, a significant wheat milling industry is located in northwest Ohio. The milling industry presently uses significant quantities of white wheat (from Michigan, Ontario or New York) in the production of various flours and cake mixes. If white wheat could be grown at high production levels in Ohio, then both the producer and miller would benefit economically. A descriptive study was conducted to measure agronomic traits of yield and winter hardiness of white wheat in northwest Ohio. Two year white wheat yields over three varieties (66.2 bushels/acre) were not significantly different from red wheat varieties (66.4 bushels/acre). Winter hardiness of white wheat was equal to red wheat.

BOARD 02 THE BIOLOGICALLY ACTIVE COMPOUNDS OF *DAUCUS CAROTA L.* **Sarah J.R. Hansen, EC Drawer #837, Richmond IN 47374-4095.**

Medicinal plants are most often found in areas were competition for food and water is common among plants. Medicinal plants are almost always higher plants. Higher plants are those which contain function which aid in competition and are not necessary for the plant's basic survival. Alkaloids and poisons are very useful in modern medicine because often those chemicals that overload our system in large amounts can sedate or aid in healing when administered in small amounts. The World Health Organization estimates that only ½ of 1% of the higher plants on this planet have been exhaustively investigated for their biologically active compounds. A biologically active compound will either aid or hinder the function of our bodies. *Daucus carota* L. has been used medicinally for hundreds of years by Native Americans to reduce fevers, as an expectorant and as a morning-after contraceptive. Studies done to identify the properties held by *Daucus carota* L. have not identified the compounds responsible for these properties. Through Solvent Partitioning, Bioassays and Thin Layer Chromatography it may be possible to isolate the biologically active compounds of *Daucus carota* L. and identify them.

BOARD 03 GROUND BEETLE BIODIVERSITY IN SOUTHERN OHIO'S MIXED-OAK FORESTS. **R.C. Stanton, F.F. Purrington and D.J. Horn, Ohio State University, Dept. of Entomology, 103 Botany and Zoology Bldg., 1735 Neil Ave., Columbus OH 43210.**

The oak-hickory forests of southern Ohio are currently succeeding to more mesic forest types. Because the reduction of oak as a major component of Ohio's forests will likely lead to a shift in species composition, the USDA Forest Service is experimenting with prescribed fire to restore the oak-dominated forest ecosystem. To determine the effectiveness of this method, a multidisciplinary project to study the ecological response of the mixed-oak forest community to fire is being conducted in Lawrence and Vinton counties. As one component of the project, ground beetle (Coleoptera: Carabidae) populations were monitored through standard pitfall and black-light trapping techniques from April to October. Results from 1995 and 1996 have contributed important information including: abundance, distribution, and seasonality of ground beetles in Ohio's mixed-oak forests; several state records; and variations in species composition among sites, years, and trapping techniques. Analysis of these data suggests that prescribed burning does not directly affect most carabid populations and ground beetle diversity is not significantly altered. 1997 results are currently being incorporated and confirm these initial conclusions. Based on these findings, prescribed burning may be an effective management tool in restoring oak-dominated forests in southern Ohio without significantly impacting carabid populations.

BOARD 04 ANGIOSPERM SEASONAL STUDIES USED TO ENHANCE CRITICAL THINKING SKILLS. **John L. Frola and David J. Stroup, Dept. of Biology, University of Akron, Akron OH 44325-3900.**

A seasonal study of two plant species (*Podophyllum peltatum* and *Arisaema triphyllum*) was carried out. Observations of the shoot apices are described based on an analysis of the theories on shoot apical organization. Measurements and descriptions of apical dome height and width of the species were obtained to serve as a basis for classroom discussions concerning the changes in apical organization over a one-year period. Results from these two studies were used to prepare a multi-media presentation which allowed students to make observations and generate hypotheses about shoot development. During classroom discussion, fundamental anatomical and morphological questions were generated to be used as the basis for student laboratory projects. This project was designed to improve identified thinking skills, and our current understanding of underground shoot apical development.

BOARD 05 EFFECTS OF SEWAGE SLUDGE ON PLANT AND SOIL HEAVY METAL CONTENT. **Dennis J. Harney, Emily Mager, Ebony Cobbins and Alfredo J. Huerta. Miami University, Botany Dept., Pearson Hall, Oxford OH 45056.**

Concentrations of Cd, Zn, Mn, and Pb in the tissues of several plant species (*Barbarea vulgaris, Galium asprellum, Solidago gramnifolia,* and *Poa spp.*), and in the top 15 cm of soil of samples from either sludge treated (1977-198) or control plots at the Ecology Research Center at Miami University. Our goal was to determine whether heavy metal concentrations in the plant and soil samples from sludge treated plots was higher than in those from untreated plots, even though those plots had not received sludge treatment since 1987. We found that of the four species tested, most showed higher heavy metal concentrations in the sludge treated plots for all metals tested except for Pb. However, *Galium aprellum* showed higher overall concentrations for most metals. The soil samples from the sludge treated plots did not show significantly higher metal concentrations than the soil samples from the control plots. We conclude that heavy metals remain in the soil for many years after application in plant available form. In addition, even though heavy metal concentrations in the sludge treated soil samples were not significantly higher than those from control plots, there was sufficient metal present to significantly increase the heavy metal content of the plants growing in the sludge treated plots. Finally, we recommend further testing of *Galium asprellum* as a potentially useful species of plant for cleaning up heavy metal contaminated soils.

BOARD 06 INVESTIGATIONS OF INVASIONS OF NON-NATIVE PLANT SPECIES IN LOCAL WOODLOTS. **Kara M. Shockey and Michael A. Vincent, Dept. of Botany, Miami University, Oxford OH 45056.**

Introduced plant species have been widely used as ornamentals in North America since the advent of European settlement. Sometimes these ornamental species have escaped from cultivation and become invasive. In the cases of Amur honeysuckle (*Lonicera maackii*), privet (*Ligustrum vulgare*), and Norway maple (*Acer platanoides*), and others, invasion into disturbed or natural habitats has resulted in significant change to the species composition of the invaded area. In southwestern Ohio, hundreds of European and Asian plant species are cultivated as ornamentals. Many of these, especially the woody species, may have fruits or seeds which may easily be dispersed by wind or animals. Some of these species have begun to spread from cultivation. In this study, we examined 5 disturbed woodlots in the Oxford area, and conducted a survey of the extent to which non-native species have invaded. Woodlots were surveyed for all woody species, and the extent to which invasion has occurred was assessed. In the woodlots studied, a total of 90 woody plant species were found, 32 of which were aliens. Percentages of aliens ranged from 19% to 42% in the study sites. Aliens most commonly found were Amur and Morrow's honeysuckle, White mulberry, European buckthorn, Oriental bittersweet, and Multiflora rose. Several previously unreported escapes were found for the state of Ohio, including species of *Magnolia, Malus, Pyrus,* and *Viburnum.*

BOARD 07 LIMB ORIENTATION AND THE FORMATION AND DISTRIBUTION OF WOOD RAYS IN *PLATANUS OCCIDENTALIS* L. **Matthew L. Duley & Roger D. Meicenheimer, Dept. of Botany, Miami Univ., Oxford OH 45056.**

As most studies of wood focus on the development of the dead tissue, little is known of the pattern development of ray parenchyma, the living component. Wood ray patterns in the leader and lateral branches of *Platanus occidentalis* L. were compared. Laterals (at least six years old) of three trees were marked along the bottom edge. The leader (at least six years old) was marked along one side at random. The stems were then removed from the trees. Sections of the stems, approximately 4cm long, were removed in two year intervals. The sections were stained, microtomed and imaged six times over a 1mm length of the section. The images were aligned by the reference mark made in the field and divided into four quadrants (for the laterals, quadrants 2 and 4 were along the gravitational axis and 1 and 3 across it). Ray number (RN), arc length per quadrant (AQ) and ray density (RN/AQ) for each quadrant were compared. A difference between the laterals and leaders was noted. In the laterals, AQ for quadrant 4 was typically larger than 2 and ray density was approximately equal among all quadrants. In the leaders, AQ and RN were not equal among any of the quadrants but the difference between quadrants exhibited no discernable pattern. AQ and RN increased over time while ray density decreased over time. This suggests that orientation away from vertical may affect wood ray patterns.

BOARD 08 NEURITE GROWTH INHIBITED BY TAXOL IN PC-12 CELLS STIMULATED BY NERVE GROWTH FACTOR. **Julie A. Davis, Heather N. Smith and Karl J. Romstedt, Biology Dept., Capital University, 2199 E. Main St., Columbus OH 43209.**

PC-12 cells are an immortal line of rat chromaffin cells which exhibit enhanced neurite growth when treated with nerve growth factor (NGF) in vitro. Since axons are rich in cytoskeletal microtubules, this study investigates the effect of a microtubule-stabilizing drug, taxol, on neurite growth. Taxol, a widely used anticancer drug, binds tightly to microtubules, stabilizes them and causes much of the cell's free tubulin to assemble into microtubules. PC-12 cells were grown on Falcon Primaria 24-well plates at 37°C in a 5% CO_2 atmosphere. Cells were plated at 10^5 cells/ml, 200 µl per well using RPMI-1640 media supplemented with 5% fetal bovine serum, 10% horse serum and 10 µg/ml gentamicin. After 3 days of exposure to NGF (50 ng/ml), neurite growth was observed to be 65.2 ± 5.72 SEM nanometers. NGF enhanced outgrowth by 44% compared to

untreated controls (t-test, p = 0.003). In the presence of 1 nM taxol, NGF-stimulated neurite outgrowth was inhibited by 95% (p = 0.013). The data supports the hypothesis that microtubule function is required for axonal growth.

BOARD 09 CELLULAR PROLIFERATION INHIBITED IN CULTURED ADRENAL CHROMAFFIN CELLS BY LOW DOSE VINBLASTINE AND NERVE GROWTH FACTOR. **Heather N. Smith and Karl J. Romstedt, Biology Dept., Capital University, 2199 E. Main St., Columbus, OH 43209.**

PC-12 cells are derived from a pheochromocytoma of rat adrenal chromaffin cells. They have been shown to differentiate in culture by exhibiting axonal and dendritic growth. This differentiation is stimulated by nerve growth factor (NGF, 50 ng/ml). Our previous work indicated that NGF-stimulated neurite growth can be inhibited by low doses of the antimicrotubule drug, vinblastine sulfate (IC_{50} = 4.4 x 10^{-10} M). To examine if this concentration is sufficient for interaction with microtubules, the effect of vinblastine on PC-12 cell mitosis was quantified following 4 days of incubation. The IC_{50} for inhibition of PC-12 mitosis was 7.9 x 10^{-11} M. NGF stimulation of neuronal maturation also inhibited mitosis by 41%. The IC_{50} of vinblastine for inhibition of NGF-treated cell mitosis was 6.4 x 10^{-10} M which is a close match for the effect on neurite growth. Since the antimitotic mechanism of vinblastine involves inhibition of microtubule function, this suggests an additional role for microtubules in neurite development. To further examine the termination of mitotic division we examined vinblastine in PC-12 culture. Mitotic division was shown to be depressed without cytotoxic effects at a concentration of 3 x 10^{-9} M. The cells were allowed to incubate in the presence of the drug for varying times (0 to 5 days). The treated cells showed little or no deviation in number over the time period. When compared to untreated control, 4 days after treatment the cells showed a maximum inhibition of 17.4 % +/- ?? Of cell number. These data suggest that vinblastine can arrest mitotic division without eliciting cytotoxic effects. These cells are known to exhibit functions similar to post ganglionic sympathetic ganglia, releasing epinephrine when stimulated. It is known that nerve cells cease mitotic division as they differentiate.

BOARD 10 AN EVALUATION OF *ARABIDOPSIS THALIANA* ROOT MERISTEMS AND MITOTIC ACTIVITY IN BOTH WILD-TYPE AND A SLOW GROWING MUTANT (MIM). **Joy E. Anderson, (Dr. John Z. Kiss & Dr. Christopher A. Makaroff), Miami University, Dept. of Botany, Oxford OH 45056.**

Arabidopsis thaliana roots provide an ideal system to study mitosis and cytokinesis. The root itself is small and the cells are nearly transparent. Meristematic activity in the root tip region provides numerous cells in various stages of mitosis and cytokinesis. A mutant (MIM) has been identified in *Arabidopsis thaliana* with slower than usual growth. Mutant plants take about two weeks longer to mature than wild type plants. Mitosis and cytokinesis will be compared between the mutant and the wild type using immunofluorescence and confocal laser scanning microscopy. The roots will be fixed in paraformaldehyde, processed for microscopy, and stained with both primary anti-ß-tubulin /FITC labeled secondary antibody fluorescence and propidium iodide. The anti-ß-tubulin /FITC causes microtubules to fluoresce green and the propidium iodide causes the chromosomes to fluoresce red. Microtuble arrays and chromosomes will be photographed at all stages of mitosis and cell division. Differences between mutant and wild-type plants will be documented and described. How detected differences in mitotic activity and cell division relate to the production of the MIM phenotype will be explored.

BOARD 11 SUBSURFACE VIEWING OF TEKTITES-A NON-DESTRUCTIVE TECHNIQUE. **Clyde S. Barnhart, 13637 Angell Rd., Athens, OH 45701-9617.**

To study internal features of black-appearing tektites, cutting and polishing thin sections is useful but time-consuming, destroys much material, and often obscures the orientation of the object to the tektite surface. My non-destructive technique allows viewing up to several mm beneath the tektite surface and removes the air-glass interface and most of the surface glare. A dissecting microscope with zoom to 65x is used. The tektite and fiber-optic light guides are immersed in a dish of water and the room darkened. The tektite is held in place by alligator clips on adjustable arms. Boiled water minimizes bubble formation and detergent enhances wetting. Stray bubbles are dislodged with a small brush or a squirt from a syringe. Although oil might be better, water is less messy. Rich viewing is provided by chips and surfaces flaked by stone-age man. Bubbles, round, elongate with rounded ends, elongate with pointed ends, and with clear glass linings, devitrified glass, opaque inclusions, white threads, streaks and swirls are seen. All could be clues to the thermal history of tektite formation.

BOARD 12 THE EFFECTS OF DEER OVERPOPULATION ON FOREST UNDERSTORY PLANTS IN DAYTON, OH. **Kellyanne R. Driscoll, Jim Runkle, Jodi Forrester, and Carl F. Friese. 300 College Park Department of Biology, University of Ohio, Dayton, OH 45469-2320.**

Many parks with forest areas are facing overpopulation of deer communities as urban sprawl encroaches upon them. The overpopulation of deer is thought to be a large contributor to the loss of herbaceous plants in forest understory. Cox Arboretum and Taylorsville Reserve, both part of the Five Rivers Metroparks system in Montgomery County, are making use of fenced exclosures to study the impact of deer on the plant community. In both parks, a fenced exclosure of 15 m x 11 m was set up in March, 1997. A 10 m^2 plot was set up within each exclosure, as well as outside of each exclosure, for plant sampling. Sampling took place in May and August of 1997. Fifteen random 1 m^2 quadrants were sampled for percent cover, herbaceous and non-herbaceous plant species richness, and woody structure. The plots were marked with wooden stakes and will continue to be monitored over the coming years. Plant species richness and relative plant percent cover show no difference between enclosed and open plots. Although the coefficient of community similarity and the percent similarity were low in May, they increased at both sites in August. When comparing the two sites to one another, we found few similarities. We hypothesize that this ongoing study will demonstrate greater differences over time between areas which are protected and those which are not protected from deer browsing.

BOARD 13 DYNAMICS AND COMPONENTS OF HAWAIIAN STREAM DRIFT: THE EFFECTS OF STREAM HYDROLOGY FROM TWO DRAINAGE BASINS. **M. Eric Benbow, Michelle F. Kearns, Albert J. Burky, & Carl M. Way. Department of Biology, University of Dayton, Dayton Ohio 45469-2320**

In streams, many aquatic organisms release from substrates and drift to new downstream habitats, while terrestrial organisms are swept into the drift. Most studies ignore terrestrial drift and there are no drift studies on Hawaiian streams. The objectives of this study were to compare aquatic and terrestrial drift components of two Hawaiian streams. Terrestrial drift density (N/m^3) can be >50% of total stream drift ranging from 6.6-59.9% (mean [X] = 37.0% over 12mo). Over three months, the terrestrial component of a larger and smaller stream ranged from 13.6-59.8% (X = 25.35%) and 23.0-87.7% (X = 51.1%), respectively; suggesting that smaller streams have a higher relative terrestrial input. This probably reflects channel morphology and gradient of two streams of different drainage basin size. Furthermore, based on basin size and discharge, larger streams have higher total drift density/m^3 stream flow. The results of this study have implications for estimating food quality and quantity available to Hawaiian fish populations.

BOARD 14 THE EFFECT OF HUMAN USAGE ON FINDLEY STATE PARK LAKE'S WATER QUALITY. **Roger Nikiforow. Mount Union College Box 1176, 1972 Clark Ave., Alliance, OH 44601**

Findley State Park Lake is located in a forested area surrounded by agricultural fields in Northern Ohio. The lake is heavily used in the spring and summer for camping, swimming, fishing, boating, and picnicking. This shallow, man-made lake often experiences a period of turbid appearance and algal bloom during the summer. In this study I examined the relationship between human usage and water quality of the lake. Through the summer of 1997, I collected water samples for nutrient analysis from five selected sites of the lake. I targeted my sampling before and after major holidays. I also sampled phytoplankton and zooplankton to determine the structure of the food chain in the lake. Lake usage information was obtained from the State Park. My results indicated that Findley Lake in the summer of 1997 did change from a relatively clear lake (Secchi=1.5 m) to a turbid lake (Secchi=0.5 m). Dissolved phosphorous concentration in the lake decreased after Memorial Day and changed very little during the summer.

BOARD 15 FOREST PRODUCTIVITY IN THREE PRIOR AGRICULTURAL LAND-USE LEGACIES IN A NEW ENGLAND TEMPERATE FOREST. **Heather L. Frankland, Mount Union College Box # 550, Alliance OH 44601.**

Prior agricultural land use often plays an important role in the present condition of forests. Research was conducted at the Harvard Forest in Massachusetts, to estimate productivity differences among 6 previously plowed, pastured, and woodlot sites and to test the hypothesis that rates of annual above ground biomass and annual litter fall in recovering forests would decline in the order of logged>pastured>plowed. Twenty five trees, of various diameters and species, were cored in each of the six stands. Two cores from each tree were analyzed and radial growth was calculated for the most recent 5 and 10 year intervals. Biomass increments were determined for the same time spans using published equations. Productivity was calculated for diameter classes within species and semi-log relationships of productivity per diameter were used estimate the productivity of the trees in the stand which were not cored. Site specific equations and species specific equations were used. Red oaks and red maples were the major contributors of biomass and litter fall in all six of the stands, accounting for about 70% of the total aboveground biomass. Although woodlots had a higher total biomass, there was not a significant difference in aboveground biomass or litterfall across the six sites. The range of productivity was from 7524 - 9014 Kg/Ha. These results fell into the range for temperate forests according to results published. Production per unit biomass was greatest in the plowed stand and least in the woodlots.

BOARD 16 SEEDLING AND HERBACEOUS PATTERNS IN RELATIONSHIP TO SOIL CONDITIONS. **Jessica L. Graham, 58 W. Oxford St., Alliance OH 44601.**

An investigation was conducted on seedling and herbaceous patterns in using a multi-variate approach to soil conditions in three prior agricultural land use sites. It was hoped that knowledge of plant preferences in their habitat would be improved. The sites were compared between themselves and the land uses. The sites were examined for correlation between the prominent vegetation populations and the chosen soil conditions. It was found that *Epigea* was significantly more common in areas with relatively less nitrogen. The woodlot sites were found to have statistically greater forest floor depths, at 72 mm.. The forest floor depth in the plowed sites was lower than in the other land uses at 41 mm, while pastured was 57 mm. The plowed sites had average amounts of available nitrogen at 48.87 ug N/g soil available to them, while the other sites had significantly lower amounts, pastured had 21.3 ug N/g soil and woodlots had 30.89 ug N/g soil. The plowed sites had less soil moisture, 2.59 g H_2O/g soil, while the pastured site had 3.15 g H_2O/g soil and the woodlot site had 3.53 g H_2O/g soil. The pastured sites were statistically lower in all categories than the woodlot sites.

BOARD 17 EFFECT OF NUTRIENT CONCENTRATION ON ALGAL BLOOM AT LAKE MOHAWK. **Mark W. Miller, 895 S. Haines Ave. Apt. #2, Alliance OH 44601.**

Lake Mohawk is a man-made lake located in Malvern, Ohio. During the past few years the lake has experienced a blue-green algae problem which has seemed to worsen tremendously in 1995 and 1996. In this study I examined nutrient concentrations to see if they had an influence on the algal bloom. In 1997, I collected water samples from several sites of the lake biweekly from May to September to determine phosphorus and nitrogen concentrations. I also measured dissolved oxygen, pH, and conductivity at each site. The summer dynamics of the nutrient concentrations will be discussed in relation to the algal bloom.

BOARD 18 HUFF RUN: FISH IBI AND ITS LINK TO WATER QUALITY. Jason T. Hudson. Mount Union College, Box 790, 1972 Clark Ave., Alliance, OH 44601.

Huff Run, a river located in Northeastern Ohio, flows through an area that was one of the most heavily mined areas in the past. Although the majority of the mining operation has ceased, many of the deep mines remain open and the strip mines remain unattended. Studies of water chemistry have shown extremely low pH in some parts of the river. But little has been done to study biological conditions of the river. In this study, I examined the fish community in Huff Run. Fish were collected using a backpack electrofisher in eight locations of the river. I identified and counted fish in the field. The IBI, Index of Biological Integrity, was used to assess the biological condition of the river. An IBI of 48-52 indicates good biological conditions. In five of the sites studied, no fish were found (IBI = 0). Two sites located in the upper watershed had IBI scores of 32 and 30, rating poor conditions. Tolerant and insectivorous species dominated these sites. In the lower part of the watershed, fish (green sunfish only) were found only in one site (IBI = 20, very poor) that was furthest downstream. The fish community was more diverse in areas above the mining sites, while only high tolerant species or no species existed within mining areas. We also examined the relationship between the IBI and water quality results. When the IBI scores were compared with the chemical water quality data, two upper sites with higher IBI scores had pH values > 6 and had lower concentrations of sulfate, Fe, Mn, and Al. Other sites had pH values < 4.5 and a higher concentration of the above metals. This study suggests that in less impacted upper watershed, river conditions are suitable for certain fish communities. In the more impacted lower watershed, the river is too acidic to support any fish species. The site in the lower watershed where green sunfish were found is where Huff Run flows into Conotton Creek. This study provides baseline information about the fish community which will be useful during the watershed restoration project.

BOARD 19 GRAVEL BARS AS HABITAT FOR DARTERS IN LAKE ERIE'S WESTERN BASIN. Ken Baker and Ted Nichpor, Dept. of Biology, Heidelberg College, Tiffin, OH 44883.

In the western basin of Lake Erie, gravel bars often form ridges extending dozens of meters into the lake from a points on islands. Although differing somewhat in structure and composition, bars are similar in being spurs of shallow, low sediment, high wave action habitat that extend into deeper waters typified by heavier sediments and reduced wave action. We investigated abundance and distribution patterns of darters on three western basin gravel bars: Alligator bar, running southwest from the southwest tip of Gibraltar Island; a gravel bar running southeast from the eastern end of Sugar Island towards Middle Bass Island; and a gravel bar running northeast from the southeast corner of North Bass Island. SCUBA-based surveys were conducted along a series of 10 m transect lines laid parallel to shore, and placed at 3 m increments along the bars out to 39 m from shore. Alligator bar was surveyed three times in June and once in July. Greenside darters (*Etheostoma blennioides*) were the most common darter and may have been non-randomly distributed along the bar. Logperch (*Percina caprodes*) and channel darters (*Percina copelandi*) were next most common and johnny darters (*Etheostoma nigrum*) were least abundant. A nocturnal survey on 27 June found 5 darters compared to 47 seen during the day. Greensides were also the commonest darter on the North Bass gravel bar in a single survey in July, but were uncommon on the Sugar Island bar in both June and July, where channel darters were much more common.

BOARD 20 LONG-TERM EFFECTS OF ENRICHED ATMOSPHERIC CO_2 CONCENTRATION, SOIL FERTILITY, AND LIGHT LEVEL ON THE INTERNAL LEAF ANATOMY OF THREE GENOTYPES OF *POPULUS TREMULOIDES*. Mark G. Kalnins and Peter S. Curtis. 55 Majestic Oaks Dr. Springboro OH 45066.

The internal leaf anatomy of three *Populus tremuloides* genotypes grown for three years in open top chambers under ambient (35.5 Pa) or elevated (70.0 Pa) CO_2 and high or low soil fertility was investigated. Mature upper (high light) and lower canopy (low light) leaves were embedded in paraffin, sectioned, and examined under a light microscope to determine whole leaf, epidermis, palisade parenchyma, and spongy mesophyll thickness. Whole leaf thickness of high and low fertility leaves significantly increased due to elevated CO_2. Palisade parenchyma thickness significantly increased due to elevated CO_2 in low fertility treatments, while spongy mesophyll thickness increased significantly due to elevated CO_2 in both fertility treatments. Abaxial epidermis thickness significantly increased due to elevated CO_2 ($P = 0.07$). High light leaves had significantly greater whole leaf, palisade parenchyma, and spongy mesophyll thicknesses compared to low light leaves in all treatments. The involvement of CO_2, soil fertility, and light environment on internal leaf anatomy could account, in part, for observed patterns of photosynthetic activity and whole tree carbon gain due to CO_2 and soil fertility.

BOARD 21 AN ANALYSIS OF THE WATER QUALITY OF SAND RUN CREEK, SAND RUN METROPARK, AKRON, OHIO. John F. Beltz, Constance E. McCambridge, Keren L. Baker, Margaret A. Bosela, Ronald J. Grimm, Andrew J. Hudak, Ellen M. Rees, and Annabelle M. Foos, Dept. of Geology, Center for Environmental Studies, University of Akron, Akron OH 44325-4101.

Sand Run Creek is a small tributary of the Cuyahoga River heavily influenced by human activities as it flows through Sand Run Metropark. Our study examined changes in water chemistry and macroinvertebrate populations along a 580-m long segment of the creek. The study area included the Sand Run Parkway ford that permits vehicular traffic to cross the stream, the Mingo Pavilion bridge that spans it, and three small-discharge tributaries. Chemical analysis of water quality examined changes in: pH, total dissolved solids, sulfates, nitrates, bicarbonates, total phosphorus, iron, and chlorine. Variations in faunal diversity and the pollution tolerance index (PTI) could reflect the response of macroinvertebrates to changing water quality. Results of chemical analysis of Sand Run upstream and downstream of the ford proved inconclusive, however, faunal analysis indicated a 44% decrease in species abundance and a 61% decrease in PTI downstream of the ford. One tributary contributed to elevated nitrate and total phosphorus levels, and a second tributary significantly increased phosphates. Water chemistry downstream of Mingo Pavilion bridge showed an increase in iron and slightly elevated levels of chlorine. The PTI decreased 67%, and the number of species present decreased 60% downstream from the bridge. Our data analysis suggests the ford, tributaries, and bridge have a significant impact on Sand Run Creek water quality and macroinvertebrate populations.

BOARD 22 SURVEILLANCE FOR *TOXOPLASMA GONDII* IN WHITE-TAILED DEER (*ODOCOILEUS VIRGINIANUS*) IN CENTRAL OHIO. Susan C. Crist (R.L. Stewart and G.R. Needham), Ohio State University, Dept. of Entomology, 211 Biological Sciences, 484 W. 12th Ave., Columbus OH 43210.

We are evaluating the ability of white-tailed deer to acquire pathogen and develop antibodies to the sporozoan, *Toxoplasma gondii*. This pathogen is cosmopolitan, negatively affecting fetuses and immunocompromised individuals. Information concerning the ability of this parasite to be harbored in deer flesh should illuminate potential health risks associated with the consumption of wild meats and the aid in our understanding of herbivore associated infection. We hypothesize that a significant percentage of hunter-killed deer in central Ohio have or had this pathogen and that a potential risk of human infection exists. Serum samples are being obtained from hunter-killed deer during the 1997-98 hunting season. An indirect hemagglutination assay is being performed to ascertain antibody level. Studies completed in other states have established the ability of this parasite to infect a variety of herbivores including the white-tailed deer.

BOARD 23 NITROGEN MINERALIZATION AND NITRIFICATION: INFLUENCE OF AGRICULTURAL LAND USE HISTORY IN A NORTHERN TEMPERATE HARDWOOD FOREST. HARVARD FOREST, PETERSHAM, MA USA. Richard G. Bakker, MUC Box 85, Alliance OH 44601-3929.

This study examines the effect of prior land use on soil N mineralization and nitrification at sites used until the 1830's for agriculture. Net mineralization was measured using a buried bag technique with one month (June-July) in field incubation. Paired fields had been plowed, pastured, or left as woodlot. Samples were extracted and then analyzed using a Latchat Auto-analyzer. Our results indicate soil continues to demonstrate the impact of historical land use. In mineral soil, we found the highest rates of net mineralization in woodlots, and a close correlation between the amount of organic matter and net mineralization. Net mineralization showed no pattern in the forest floor. Mineralization rates were between 17.6 and 42.5 kgN/ha/month, where as nitrification rates fell between 0.029 to 0.385 kgN/ha/month. The correlation between organic matter and net mineralization had an r^2 of 0.1649. The same comparison with net nitrification had an $r^2 = 0.3639$. This data leads us to believe that the forest floor has recovered from the 19th century land use. In mineral soil, a distinct pattern in line with disturbance history forms. When net mineralization and nitrification rates are correlated to the soil organic carbon one observes r^2 values of 0.8078 and 0.7424. This correlation indicates that the time organic carbon took to filter down to mineral soil has allowed effects of the disturbance to linger.

BOARD 24 HABITAT PRESERVATION KNOWLEDGE AND ATTITUDES IN THE GENERAL POPULATION. F. John Kluth, 1060 DeLeone Dr, Kent OH 44240-2026.

For many years scientists have been doing experiments that indicate environmental degradation. Politicians often ignore this work, or call for more studies to be done. Environmental disasters need to be prevented, so this gap between research and action needs to be better understood. With this in mind I have prepared a questionnaire that collects data about habitat preservation knowledge and attitudes in the general population. As of November 11, 1997, 26 residents of Kent, Ohio had filled out the answer forms. The form of the questionnaire was multiple choice with subjects asked to pick the best of four alternative responses to a statement about habitat preservation. Ten of the items involved knowledge of the subject. These items were selected from a questionnaire given to a group of people who attended an environmental seminar in Columbus in February, 1997 based upon their internal consistency. The score of these knowledge items was then correlated to each of the items on the questionnaire. The score of the 10 knowledge items had a mean of 3.48 and a standard deviation of 1.64. The difficulty of the questions varied from one which only 2 got correct to another which had 20 correct answers. Correlations included -.18 for students, .34 for business people, .33 for people in economics, .35 for persons between 31 and 65, and -.31 for persons between 66 and 100. The question relating to the earth's carrying capacity had the following correlations: .61 for 5 billion, -.29 for 10 billion, -.17 for 100 billion, and -.30 for 1000 billion. Other correlations suggest that information obtained from schooling is no longer valid and that a better mechanism for good environmental information needs to be provided.

BOARD 25 PRIMARY MARKET AREAS OF OHIO'S STATE-ASSISTED UNIVERSITIES, 1982-1996. Yu Zhou, Bruce W. Smith, and Joseph G. Spinelli, Dept. of Geography, Bowling Green State University, Bowling Green OH 43403.

This is a comparison of student recruitment from Ohio counties using a market penetration index (MPI), comparing 1982 with 1996 OBOR data. In the interval studied, in-state enrollment to state-assisted universities declined by 15,861 (or 7.2%). The MPI provides an indicator of the strength of each main-campus state university's drawing power within each of the 88 counties based on relative numbers rather than absolute numbers. The index presumes that each university's proportional share of the total Ohio enrollment should be found operating in each of the 88 counties. In 1982, the highest index number was 2.79 and the lowest was 0.17, while in 1996, the highest and lowest MPIs were 2.23 and 0.21, respectively. Results reveal that recruitment regions are sharply demarcated along county boundaries (as this is the unit used) with little evidence of a transition zone from one university's market hinterland to another. The authors have classified all state-assisted universities into one of two categories: 1) those with a state-wide

attraction, and 2) those that are strongly localized and commuter-oriented. As a further indicator of the geographic drawing power, each university is shown with the percentage of its Ohio students coming from within a 50-mile radius. The final conclusion is that there has been remarkably little change in the period 1982-1996.

BOARD 26 EFFECTS OF SEDIMENT RESUSPENSION ON PHOSPHORUS AVAILABILITY AND PHYTOPLANKTON GROWTH IN A EUTROPHIC RESERVOIR. **Wendy L. Parisi, Jenifer L. Headworth and Michael J. Vanni, Dept. of Zoology, Miami University, Oxford OH 45056.**

Sediment particles can be a substantial source of phosphorus available for uptake by phytoplankton, or may inhibit phytoplankton growth by decreasing light availability. In shallow lakes, wind resuspension of sediments may increase the accessibility of bioavailable phosphorus to phytoplankton. We measured bioavailable phosphorus in resuspended and deposited sediments at three sites in Acton Lake, a eutrophic reservoir in southwestern Ohio, in summer and fall 1997. The inflow site (depth 1.5m) was near stream inflows; the middle site was in water equal to the lake's mean depth (4m); and the outflow site (depth 8 m) was near the lake's dam. The inflow and middle sites are not thermally stratified, while the dam site exhibited strong thermal stratification. Rates of bioavailable phosphorus resuspension increased throughout the season, ranging from 6.2 to 18.0 mg $P{\cdot}m^{-2}{\cdot}day^{-1}$. Rates (mg $P{\cdot}m^{-2}{\cdot}day^{-1}$) were highest at the inflow site (mean 30.9), intermediate at the middle site (mean 10.4), and lowest at the outflow site (7.1). To determine effects of bioavailable P on phytoplankton we also conducted an experiment in which phytoplankton were incubated at different concentration of lake sediments. Phytoplankton primary productivity decreased with increasing sediment concentrations. This suggests that although resuspended sediments provide potentially significant amounts of bioavailable P, the net effect of sediment resuspension is decreased phytoplankton growth, presumably due to decreased light availability.

BOARD 27 SIGNIFICANCE OF ARG182 LOCATED IN THE SECOND EXTRACELLULAR DOMAIN OF RAT AT2 RECEPTOR IN LIGAND BINDING. **Jason Kurfis, Dieter Knowle, Nara Gavini and Lakshmi Pulakat, Dept. of Biological Sciences, Bowling Green State University, Bowling Green OH 43403.**

The Angiotensin II (Ang II) receptor subtypes AT1 and AT2 share only 34% homology at amino acid level. These two receptors are different from each other in their ligand selectivity, sensitivity to non-hydrolyzable GTP analogues and in their biological functions. While the AT1 receptor is known to be coupled to Gq protein that mediates activation of phospholipase C, the AT2 receptor does not seem to couple to any G-proteins. The amino acid residue Arg167 located in the second extracellular loop of rat Ang II receptor type AT1 is conserved in all known AT1 receptors from other organisms and was shown to be essential for the high affinity binding of both peptidic and non-peptidic ligands by this receptor. This conserved Arg of the AT1 receptor is also conserved in rat AT2 receptor at position 182. To test the role of Arg182 in determining the binding affinity to the ligands of AT2 receptor, we have generated AT2 receptor mutants in which the Arg182 was replaced with glutamic acid or alanine. The mutated receptors were expressed in *Xenopus* oocytes by microinjecting the corresponding cRNA and the binding affinities of these receptors to peptidic ligands ^{125}I-[Sar^1 Ile^8]Ang II (non-specific for AT2 receptor type), ^{125}I-CGP42112A (AT2 receptor specific) and the non-peptidic ligand PD123319 (AT2 receptor specific) were evaluated. Our studies suggest that replacing Arg182 with Lysine resulted in decreasing the affinity of this receptor to CGP42112A considerably. This indicates that Arg182 of the AT2 receptor may play a role similar to the Arg167 of the AT1 receptor in determining the receptor's binding affinity to its specific ligands.

BOARD 28 ROLE OF LYS215 LOCATED IN THE FIFTH TRANS-MEMBRANE DOMAIN OF THE AT2 RECEPTOR IN LIGAND-RECEPTOR INTERACTION. **Lakshmi Pulakat, Amha S. Tadesse and Nara Gavini, Dept. of Biological Sciences, Bowling Green State University, Bowling Green OH 43403.**

Studies on ligand-receptor interaction of Angiotensin II (Ang II) receptor type 1 have shown that for peptidic ligands to bind this receptor they must interact via their carboxylate group to the positively charged side chain of the Lysine residue 199 located in the 5th transmembrane domain of this receptor. In the Ang II receptor type AT2, this Lysine residue is conserved at position 215 in the 5th transmembrane domain. To determine the specific mechanism of ligand binding to the Ang II receptor type AT2, mutated AT2 receptors were generated in which the Lys215 was replaced with Glu, Gln, Ala and Arg. The ability of these mutated receptors to bind peptidic ligands ^{125}I-[Sar^1 Ile^8]Ang II (non-specific for AT2 receptor type), ^{125}I-CGP42112A (AT2 receptor specific) and the non-peptidic ligand PD123319 (AT2 receptor specific) was evaluated by expressing these receptors in *Xenopus* oocytes and performing binding assays. The Lys215 Glu and Lys215 Gln mutants of AT2 receptor lost their affinity to ^{125}I-[Sar^1 Ile^8]Ang II, but retained their affinity to ^{125}I-CGP42112A and PD123319. In contrast, Lys215Arg mutant exhibited higher affinity to ^{125}I-[Sar^1 Ile^8]Ang II than wild type, and lower affinity to ^{125}I-CGP42112A. The Lys215Ala mutant lost its affinity to both ^{125}I-[Sar^1 Ile^8]Ang II and ^{125}I-CGP42112A. These results suggested that the binding mechanism of ^{125}I-[Sar^1 Ile^8]Ang II to AT2 receptor is similar to that of AT1 receptor since an amino acid with positively charged side chain (Lys or Arg) located in the fifth transmembrane domain is required for this ligand to bind AT2 receptor. In contrast, although CGP42112A is a peptidic ligand, it does not require an interaction with the positively charged side-chain of an amino acid in the fifth transmembrane domain for its binding to AT2 receptor. Instead, the binding requirements for CGP42112A binding to AT2 receptor seem to be similar to those for the non-peptidic ligand PD123319.

BOARD 29 STUDIES ON THE ROLE OF HIS273 IN THE AGONIST BINDING AND ACTIVATION OF RAT ANGIOTENSIN II RECEPTOR SUBTYPE AT2. **Cortney Turner, Shannon Cooper, Nara Gavini and Lakshmi Pulakat, Dept. of Biological Sciences, Bowling Green State University, Bowling Green OH 43403.**

Previous studies have shown that binding of Ang II to the rat Angiotensin II (Ang II) receptor type AT1 results in Phospholipase C (PLC) activation mediated by the Gq protein. The His256 residue located in the 6th transmembrane domain of rat AT1 receptor is essential for its interaction with Ang II and agonist activation of this receptor. Unlike the AT1 receptor, the Ang II receptor subtype AT2 does not seem to couple with G_q protein or activate PLC in any of the cell types studied to date. However, the His256 residue of rat AT1 receptor is conserved in the sixth transmembrane domain of rat AT2 receptor at position 273. To analyze the role His273 in ligand binding and agonist activation of rat AT2 receptor we have replaced this residue with glutamine and arginine. Previously, we have generated a chimeric receptor in which the 3rd intracellular loop (ICL) of rat AT2 receptor was replaced with the 3rd ICL of rat AT1 receptor. Although this chimeric receptor has reduced affinity to Ang II, it has demonstrated ability to couple with G_q protein and activate PLC. To elucidate further the role of His273 in agonist activation of rat AT2 receptor, we have also generated mutants of chimeric receptor in which His 273 was replaced with glutamine and arginine. The effects of these mutations on the wild type and chimeric AT2 receptors were studied by expressing these receptors in *Xenopus* oocytes. Ligand-binding experiments using the AT2 receptor specific ligands CGP42112A and PD123319 suggested that the His273Arg mutant of the chimeric receptor retained the affinity to the CGP42112A, however, this binding could not be blocked with PD123319.

BOARD 30 INTEGRIN BETA-4 TRANSCRIPTIONAL REGULATORY ELEMENTS. **Nikki P. Buran (Dr. Simon Lawrance), Dept. of Life Science, Otterbein College, Westerville OH 43081.**

The purpose of this study is to explore the sequences which encode the regulatory elements of integrin beta-4. Five cosmid clones containing human integrin beta-4 have been isolated with a full length integrin beta-4 cDNA. Amplification of DNA isolated from these cosmids with primers corresponding to the five prime end of integrin beta-4 shows that three of these clones contain 5' sequences. The fragments containing these 5' sequences will be subcloned and sequenced. Primers flanking the promoter will be synthesized and a panel of human DNAs will be examined for polymorphisms. Polymorphisms in the regulatory elements may affect the expression of integrin beta-4. Variations in expression may be responsible for certain diseases. For example, integrin beta-4 is inappropriately expressed in psoriatic keritinocytes. The next phase of this study will be to explore whether mutations and/or polymorphisms in the transcriptional regulatory elements of integrin beta-4 play a role in familial and/or acquired forms of diseases such as psoriasis.

BOARD 31 FACIES EFFECTS ON EPIBIONT COMMUNITIES IN THE LATE ORDOVICIAN IN THE CINCINNATI ARCH REGION. **Renae E Bexfield, (Dr. Halard Lescinsky), Otterbein College, 1 Otterbein College, Westerville OH 43081.**

This study investigates the effect of environmental parameters (wave action, mud or lime content and productivity) on the composition and structure of epibiont communities in the Upper Ordovician strata (Cincinnatian Series) of Ohio, Kentucky, and Indiana. Over 750 hosts including *Hebertella*, *Lepidocyclus*, *Onniella*, *Platystrophia*, *Rafinesquina*, *Sowerbyella*, crinoids, orthocone cephalopods, and rugose corals were collected from 13 sites representing a variety of facies (e.g. nearshore - Mt. Auburn; coral biostrome - Upper Bull Fork; mid-shelf - Corryville, Bull Fork; and deep shelf - Kope). Abundance, diversity, growth structures, distribution, and location of epibionts (e.g. cornulitids, various bryozoans, inarticulate brachiopods, and corals), are recorded to provide a clear view of the ecological community. Preliminary observations reveal biofacies differences based on the environmental parameters. Deep shelf environments have few epibionts resulting from small host size and low productivity. Abundance peaks in mid-shelf environments where hosts are larger and productivity is high. Nearshore environments have a different suite of epibionts probably due to clearer water and high wave action.

BOARD 32 THE COMPETITIVE EFFECTS OF *LONICERA MAACKII* ON THE UNDERSTORY PERENNIAL HERB, *ALLIUM TRICOCCUM*. **Karen N. Doersam & David L. Gorchov. Dept. of Botany, Miami University, Oxford OH 45056.**

Lonicera maackii (Rupr.) Herder (Caprifoliaceae), Amur honeysuckle, is an invasive shrub native to northeast Asia that now infests forested areas and open fields in at least 26 eastern states. Leaf expansion of *L. maackii* occurs before canopy leaf expansion, thereby shading native forest herbs earlier. This shading is hypothesized to negatively affect fitness and survival of many native herbs. The purpose of this study was to determine if the early leaf expansion of *L. maackil* had an adverse effect on *Allium tricoccum* Aiton. (Liliaceae), Wild Leek, a spring ephemeral perennial herb. *A.tricoccum* bulbs were transplanted (four per plot) into two wood lots near Oxford, Ohio, in June 1995. In 1977 at the Gregg Woodlot site consisted of 30 blocks, each with one plot where *L. maackii* was removed and one where *L. maackii* was present. At Western Woods there were 20 blocks each containing one plot of each of three treatments; *L. maackii* removed, *L. maackii* present, and *L.* maackii absent. At Gregg Woodlot, *A. tricoccum had more leaves, greater leaf area, and were more* likely to flower in 1997 in the *L. maackii*-removal plots. For the flowering individuals, fruit and seed production were also higher in this treatment. However at the other site, Western Woods, none of these demographic variables differed between treatments. The negative effect of *L.* maackii on *A. tricoccum* at Gregg Woodlot, but not in Western Woods, may be due to the more open canopy and greater density of *L. maackii* at Gregg Wood lot. These results suggest that this invasive species negatively affects spring ephemerals in disturbed deciduous forests, or stands with high densities of this shrub.

BOARD 33 LEAF NITRATE REDUCTASE ACTIVITY IN DAUCUS CAROTA IS ELEVATED IN NITROGEN-TREATED FIELD PLOTS. MICHAEL D. WILSON AND SHERYL M. PETERSEN, (PRUDENCE J. HALL), DEPT OF BIOLOGY, HIRAM COLLEGE, HIRAM OH 44234.

Elevated leaf nitrate reductase activity is typically induced in greenhouse-grown plants by irrigation with nitrate solutions. Some data suggest a similar response to applied nitrate fertilizer in field-grown plants. We have hypothesized that applied ammonium nitrate or ammonium phosphate fertilizers should induce leaf nitrate reductase activity in *Daucus carota* growing in old-field successional plots. A qualitative colorimetric leaf-disc assay for nitrate reductase activity was used to compare leaf enzyme activities of plants in nutrient-enriched and control plots. Assay results showed consistently elevated nitrate reducatase activity in plants from treated plots at 6 to 8 weeks after fertilizer application. No significant changes in chlorophyll content were observed. The financial support of Dr. Bruce and Janet Johnson is gratefully acknowledged.

BOARD 34 ROOT ACID PHOSPHATASE ACTIVITY DECREASES AND ISOENZYME PATTERNS CHANGE IN FIELD-GROWN *BARBAREA VULGARIS* IN RESPONSE TO PHOSPHATE FERTILIZER. KELLY L. DILLON, MICHAEL D. WILSON, SHERYL L. PETERSEN; (PRUDENCE J. HALL); DEPARTMENT OF BIOLOGY, HIRAM COLLEGE, HIRAM OH 44234.

Acid phosphatases of plant roots are thought to aid in phosphate assimilation of plants growing in phosphate-deficient soils. We have hypothesized that acid phosphatase activity should increase in crude root extracts prepared from *Barbarea vulgaris* harvested from unfertilized field plots. Alternatively, activity in root extracts of plants from plots fertilized with ammonium phosphate should be decreased. We further hypothesized that expression of acid phosphatase isoenzymes should change in response to phosphate treatment. Acid phosphatase activity in root extracts was measured colorimetrically. Isozymes were separated on native polyacrylamide gels and were stained to show acid phosphatase activity. Preliminary analysis of enzyme specific activity showed increased activity in unfertilized plots. Different bands of acid phosphatase activity can be observed in extracts of roots from control and phosphate-treated plots. The financial support of Dr. Bruce and Janet Johnson is gratefully acknowledged.

BOARD 35 CHANGES IN VIRULENCE DIVERSITY AMONG POPULATIONS OF *PUCCINIA RECONDITA* FOLLOWING SELECTION. JEFFREY S. LEHMAN AND CARL D. GELFIUS, DEPT. OF LIFE SCIENCES, OTTERBEIN COLLEGE, WESTERVILLE, OH 43081 AND GREGORY SHANER, DEPT. OF BOTANY & PLANT PATH., PURDUE UNIVERSITY, WEST LAFAYETTE IN 47907.

The ability of populations of the rust fungus *Puccinia recondita* f. sp. *tritici* to respond to the selection pressure of partially resistant wheat is not well understood. The objective of this study was to determine if wild-type, asexually reproducing populations of *P. recondita* f. sp. tritici respond to selection for shortened latent period on partially resistant wheat cultivars Cl 13227 or Sw 72469-6. Frequencies of virulence phenotypes (a qualitative trait not under direct selection) were used as "phenotypic markers" to monitor changes among wild-type and selected populations. In wild-type populations, phenotype FBR, with virulences to host resistance genes Lr2c, 3, 3ka, 11, and 30, was sampled at a frequency of 80-100%. After selection of wild-type populations for shortened latent period on either partially resistant cultivar, the frequency of FBR decreased by 23-67% while the frequency of phenotypes FLT, KLT, and PBR, with additional virulences to Lr9 and 17; Lr2a, 9, and 17; or Lr1, respectively, increased. Following these changes, the frequencies of virulence phenotypes in the selected populations were more evenly distributed, and phenotypic diversity as measured with Shannon indices increased. These changes in race-specificity and population structure after selection for shortened latent period suggests that P. recondita f. sp. tritici is capable of adapting to the partial resistance of Cl 13227 and Sw 72469-6.

BOARD 36 DEGRADATION OF HYDROGEN PEROXIDE BY LEACHATES FROM MAIZE LEAVES THAT VARY IN THEIR SUSCEPTIBILITY TO CERCOSPORIN AND TO GRAY LEAF SPOT DISEASE. M. O. GARRAWAY AND J. D. BELTRAN, DEPT. PLANT PATHOLOGY, OHIO STATE UNIVERSITY, COLUMBUS OH 43210.

Leaf segments from two maize cultivars with susceptibility and two with resistance to gray leaf spot, were evaluated for their sensitivity to cercosporin, by immersing 4 x 1.5 cm segments in 25 ml distilled water (DW) without or with 0.25 or 0.5 µg/ml cercosporin, then measuring the loss of electrolytes, as changes in conductivity (µmhos/mg dry wt./24hr) in the DW, following incubation for 48 or 72 h in the dark at 28 C. Electrolyte loss from cercosporin-treated susceptible leaf segments was 2-3x more than the controls without cercosporin, and was 5-7-fold greater than that from cercosporin-treated resistant leaf segments. Also, the sensitivity of susceptible maize leaves to cercosporin decreased up to 80% when they were incubated in the light. Leaf leachates from dark-incubated resistant leaves degraded H_2O_2 at 2- 3x the rate of those from dark-incubated susceptible leaves. Moreover, the exposure of leaves of susceptible maize cultivars to light increased the ability of their leachates to degrade H_2O_2 while decreasing their sensitivity to cercosporin. These data support the conclusion that H_2O_2 plays a mediating role in the injurious effects of cercosporin, a toxin associated with gray leaf spot disease, on susceptibe maize leaves.

BOARD 37 DEVELOPMENT OF THE MIAMI UNIVERSITY DENDROLOGY EXPERT SYSTEM. ROGER D MEICENHEIMER, DEPT. OF BOTANY, MIAMI UNIVERSITY, OXFORD OH 45056.

The CD-ROM based Miami University Dendrology Expert System (MUDES) was recently developed by undergraduate students and myself using the XID random access expert system authoring software. The MUDES currently consists of four multiple entry interactive keys to Angiosperm and Gymnosperm tree species and wood genera common to southwestern Ohio. Each component is associated with on-line help text and color graphics and species specific color graphics illustrating diagnostic characteristics of vegetative and reproductive tree and microscopic wood features. Alpha versions of the MUDES were field tested by Dendrology students using notebook computers during the last two years. Results of comparison tests between students using the MUDES and students using paper dichotomous keys (DKs) indicate that the MUDES is as accurate with regard to student identification of unknowns as DKs, and that students using the MUDES identify a given specimen on average about 113 seconds faster than their colleagues using DKs. Most all students using the MUDES report that it is easier to use than a textbook for obtaining new information about plant taxa and for reviewing material covered on quizzes and exams. All students report that the MUDES is easier to use than DKs and nearly all find the on-line help text and graphics, and species specific graphics extremely useful. Primary pedagogic advantages of the MUDES include the ease with which undergraduates can become engaged in expanding the databases and enrichment of the students' understanding of species characteristics. The MUDES will be available for participant evaluation.

BOARD 38 THE DIVERSITY OF ODONATA IN THE SHAKER TRACE WETLANDS AND MIAMI WHITEWATER FOREST, HAMILTON COUNTY PARK DISTRICT. JAN TRYBULA. DEPARTMENT OF ZOOLOGY. MIAMI UNIVERSITY. OXFORD OH 45056.

Increased acreage of wetlands in The Miami Whitewater Forest has increased the number of aquatic pest species. This in turn has lead to an increase in the odonate population whose larvae and adults prey on many insect pests associated with aquatic habitats. The goal of this study was to inventory the odonate species in the Shaker Trace Wetlands and compare that to those species found within the forested areas, specifically The Timber Lakes region. Specimens were collected by aerial netting at the wetlands and the Timber Lakes region with additional collections at other locations within the park. Successful collections were conducted between 1 May 1997 and 31 October 1997. Eighty-two specimens from six odonate families were collected. The greatest numbers were from the Libellulidae and Coenagrionidae, as expected. Species composition differed between the wetlands and the Timber Lakes, as expected. Species composition differed slightly from a preliminary study in 1996. The greatest increase came in the number of specimens of *Sympetrum spp.* which were not as abundant in the wetlands the previous year. However, fewer individuals of *Tramea spp.* were observed and collected in the current year.

BOARD 39 SURVEY OF THE INSECTS INHABITING THE FUNK BOTTOMS WILDLIFE AREA AND SHREVE LAKE WILDLIFE AREA. ROGER N. WILLIAMS, ROY W. RINGS, AND CHRISTOPHER J. GERTZ, DEPT. OF ENTOMOLOGY, OARDC/OSU, 1680 MADISON AVE., WOOSTER OH 44691-4096.

Insects were surveyed over the 1997 growing season at Funk Bottoms Wildlife Area and Shreve Lake Wildlife Area using several different collecting techniques. This was the second year of such a survey in the Funk Bottoms Wildlife Area and the first year at the Shreve Lake Wildlife Area. These studies were concentrated on two families of Coleoptera (beetles), the Histeridae and Nitidulidae, as well as monitoring all species of night flying Lepidoptera (moths and butterflies). We also have collected many other insects however, these have not been determined to date. A total of 359 species of Lepidoptera were collected at Shreve Lake Wildlife Area in 1997. In addition to the Lepidoptera, 16 species of Nitidulidae as well as, 7 species of Histeridae were collected. A total of 295 species of Lepidoptera were collected at the Funk Bottoms Wildlife Area in 1997. In 1995 303 species of Lepidoptera were collected at this same site. There were 112 new additions in 1997.

Official Announcement

Saturday, April 4, 1997, 5:15 P.M.
Miami University-Middletown, Middletown, Ohio
Johnston Hall— Room 116

ANNUAL BUSINESS MEETING
FOR MEMBERS ONLY:

There shall be an Annual Business Meeting for the membership of the Academy during the Annual Meeting. The business session shall be conducted in accordance with the most recently published edition of "*Robert's Rules of Order*".

The order of procedure shall be as follows:

A. A Call to Order by the President.

B. A summary of the Minutes of the previous meeting shall be read by the Secretary.

C. Presentation of the report of the tellers of the election of officers and other positions.

D. Voting on any proposed amendments to the *Constitution* or *By-Laws*. See page 50-60.

E. Business from the floor.

F. Adjournment.